United States Court of Appeals

for the Second Circuit

APPELLEE'S BRIEF

74-2284

Nos. 74-2345, 74-22[illegible]4, [illegible]28[illegible]
74-2308, 74-2[illegible]49, & [illegible]4-2450

IN THE UNITED STATES COURT OF APPEALS
FOR THE SECOND CIRCUIT

THE B.F. GOODRICH COMPANY,

Petitioner,

v.

PETER J. BRENNAN, ET AL.,

Respondents.

THE SOCIETY OF THE PLASTICS INDUSTRY, INC.,

Petitioner,

v.

OCCUPATIONAL SAFETY & HEALTH
ADMINISTRATION, ET AL.,

Respondents.

HOOKER CHEMICALS & PLASTICS CORPORATION,

Petitioner,

v.

OCCUPATIONAL SAFETY AND HEALTH
ADMINISTRATION, ET AL.,

Respondents.

UNION CARBIDE CORPORATION,

Petitioner,

v.

UNITED STATES DEPARTMENT OF LABOR, ET AL.

Respondents.

AIR PRODUCTS AND CHEMICALS, INC.,

Petitioner,

v.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION, ET AL.,

Respondents.

TENNECO CHEMICAL, INC.,

Petitioner,

v.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION, ET AL.,

Respondents.

ON PETITIONS FOR REVIEW OF THE SECRETARY OF LABOR'S VINYL CHLORIDE STANDARD

BRIEF FOR THE RESPONDENTS

Of Counsel:

WILLIAM J. KILBERG,
Solicitor of Labor,

BENJAMIN W. MINTZ,
Associate Solicitor for
Occupational Safety & Health,

MICHAEL H. LEVIN,
STEPHEN YOHAY,
DAVID KUCHENBECKER.
Attorneys,
Department of Labor,
Washington, D. C. 20210.

CARLA A. HILLS,
Assistant Attorney General,

STEPHEN F. EILPERIN,
Attorney,
Department of Justice,
Washington, D.C. 20530.

I N D E X

CITATIONS

Cases:

Cases (Cont'd.): Page

Statutes and Regulations:

Occupational Safety and Health Act of 1970:

IN THE UNITED STATES COURT OF APPEALS
FOR THE SECOND CIRCUIT

Nos. 74-2345, 74-2284, 74-2286
74-2308, 74-2449, & 74-2450

THE B.F. GOODRICH COMPANY,

Petitioner,

v.

PETER J. BRENNAN, ET AL.,

Respondents.

THE SOCIETY OF THE PLASTICS INDUSTRY, INC.,

Petitioner,

v.

OCCUPATIONAL SAFETY & HEALTH
ADMINISTRATION, ET AL.,

Respondents.

HOOKER CHEMICALS & PLASTICS CORPORATION,

Petitioner,

v.

OCCUPATIONAL SAFETY & HEALTH
ADMINISTRATION, ET AL.,

Respondents.

UNION CARBIDE CORPORATION,

Petitioner,

v.

UNITED STATES DEPARTMENT OF LABOR, ET AL.,

Respondents.

AIR PRODUCTS AND CHEMICALS, INC.,

Petitioner,

v.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION, ET AL.,

Respondents.

TENNECO CHEMICAL, INC.,

Petitioner,

v.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION, ET AL.,

Respondents.

ON PETITIONS FOR REVIEW OF THE SECRETARY OF LABOR'S VINYL CHLORIDE STANDARD

BRIEF FOR THE RESPONDENTS

STATEMENT OF THE ISSUES PRESENTED

1. Whether the Secretary of Labor, with good reason and with evidentiary support, properly required industry to use all feasible engineering and work practices to reach a 1 ppm permissible exposure level for vinyl chloride, while in the interim providing respiratory protection.

2. Whether the requirement that industry use its best efforts to reach the lowest practicable level of vinyl chloride exposure through feasible engineering and work practice controls, is unconstitutionally vague.

3. Whether the Secretary of Labor's standard is valid in all other challenged respects.

4. Whether the motions for a stay of the Secretary of Labor's standard should be denied since petitioners are unlikely to prevail on the merits, grant of a stay would be contrary to the public interest and injure workers more than industry, and an adequate remedy exists under the Occupational Safety and Health Act, 29 U.S.C. 655(b)(6)(A), for petitioners to obtain a temporary variance order should they be unable to meet the standard's respirator requirements because of unavailability of materials or equipment.

NATURE OF THE CASE

These are consolidated petitions for review of the Secretary of Labor's standard regulating worker exposure to vinyl chloride, a chemical which in the United States has caused 13 deaths through liver cancer to those

employed in its production and use. The Secretary's standard requires industry to use all feasible and practical engineering and work practices to reduce the concentration of vinyl chloride to 1 part per million [1/] in the working environment. Concededly, the polyvinyl chloride manufacturers will be unable immediately, through engineering alone, to reduce the vinyl chloride exposure of each and every one of its workers to that 1 ppm level. And the same may be said of the vinyl chloride monomer producers.

Because of this, and until that 1 ppm goal is reached, the Secretary's standard obligates industry during 1975 to offer its workers respiratory protection, an offer which the employees may decline if the working atmosphere is below 25 ppm of vinyl chloride. After one year, respiratory protection becomes mandatory.

The principal challenge to the Secretary's standard is that he has overreacted to the hazard of vinyl chloride and to the deaths of those workers. The obligation placed on industry to use its best efforts in making a practicable and feasible attempt to reach the 1 ppm goal, while in the interim offering respiratory protection, is claimed to be unreasoned, overly burdensome and too vague.

Given the proven nature of the hazard, and Congress' clear intention to force industry to technological innovation so as to assure a safe working environment, we

---

1/ The term parts per million expresses the number of parts of vapor or gas per million parts of contaminated air by volume at 25° centigrade and 760 mm. Hg. pressure. 29 C.F.R. 1910.93 G-1, n.a. (1973).

think industry's obligation to use its best efforts is neither too burdensome nor too vague. Indeed, it is nothing more than what industry professed a willingness to do. That the engineering goal is more ambitious than industry had hoped does not invalidate the standard, for a failure to reach the 1 ppm concentration through engineering is tempered by considerations of practicality and feasibility. Finally, that respiratory protection is to be offered, and after a period of time required, is not unreasoned, for the Secretary could legitimately conclude that there is nothing else to guard against the unwarranted risk of still more deaths until the 1 ppm level is attained.

STATEMENT OF FACTS

A. Discovery of the Link.

When vinyl chloride was first produced in the late 1930's, its danger was thought to inhere in its explosive properties. App. 3830. Indications that vinyl chloride posed an occupational hazard to workers first surfaced after World War II. A 1949 study conducted among vinyl chloride workers in the Soviet Union found liver damage in 15 of the 48 workers studied. App. 3787. Tr. 215, Supp. App. 74 . In 1958 and 1959 Dow Chemical scientists elicited liver irregularities in rats and rabbits at a 100 ppm concentration of vinyl chloride. Tr. 232-235, Supp. App. 81-84. Intermittent warnings continued throughout the 1960's. App. 3787, 3907. In 1966 and 1967 attention was called to the association of vinyl chloride with acroosteolysis, an affliction which numbs the skin

and bones of the hands and feet. App. 3787, 3828, 3848. Laboratory experiments had earlier showed some slight reversible liver damage to rats exposed to 100 ppm of vinyl chloride over a six months period, 7 hours a day. App. 3831. Occupational reports of hypertension, vascular lesions, nervous system and kidney damage and scleroderma later appeared. App. 3787.

Despite these intermittent warnings, regulation of worker exposure to vinyl chloride proceeded slowly. Until 1962, a 500 ppm time weighted average 2/ exposure level had been recommended. App. 3830. In 1963 the 500 ppm concentration was recommended as a ceiling, and the average reduced to 200 ppm. More stringent regulation, to a 50 ppm time weighted average, suggested by the scientists who had elicited reversible liver damage in rats at 100 ppm, was rejected. App. 3831. The 200 ppm time weighted average and 500 ppm ceiling remained the industry recommended standard. It was imposed by the government as a national consensus standard under the Occupational Safety and Health Act in 1971. App. 3830-3832, 3871.

Then, also in 1971, Professor Viola of the Regina Eleva Institute for Cancer Research, Rome, Italy, experimenting with vinyl chloride at the high dose of 30,000 ppm (4 hours per day, for five days a week, for 12 months)

2/ The term "time weighted average" (TWA) expresses the results of computations which reveal a worker's cumulative exposure to a toxic substance during a 9 hour shift. See 29 C.F.R. 1910.93q(a)-(d) (1973).

reported that he had found some cancers of the skin, bone and lungs in rats. App. 3778, 3928, 3961.

Shortly thereafter, on September 27, 1971, a patient of Dr. J. L. Creech, Jr., plant physician of the B.F. Goodrich Chemical Company, Louisville, Kentucky, died. App. 3959. His patient had been employed for 15 years as a helper and operator in Goodrich's Louisville plant engaged in the production of polyvinyl chloride (PVC). When first hospitalized a tentative diagnosis was made of a bleeding duodenal ulcer. Upon re-admittance and after an exploratory laparotomy and biopsy was carried out, he was found to have angiosarcoma of the liver, an exceptionally rare and irreversible cancer which strikes only 1 person in some 50,000, no more than 20-30 persons a year. App. 3782, 3788-89, 3959-60; App. 89.

Eighteen months later, on March 3, 1973, another former employee of the Louisville plant died. A third died on December 19, 1973, again of angiosarcoma of the liver. Recognizing the rarity of the tumor and learning that all three had worked in the Goodrich PVC plant, Dr. Creech brought the matter to the attention of Goodrich, and then on January 22, 1974, to the attention of the National Institute of Occupational Safety and Health (NIOSH). App. 3959-60, 3779, 3851-3853.

On January 24 the Occupational Safety and Health Administration and NIOSH conducted a walk-through of the plant and recommended precautionary monitoring and control procedures. App. 77. By February 1, 1974, NIOSH had alerted other federal agencies with health research responsibilities. It was concluded that a new occupational cancer had been discovered, that the cancer was associated with the polymerization of vinyl chloride in the manufacture of polyvinyl chloride, and that vinyl chloride was the suspect agent. App. 3780-3781, 3885, 3903-04.

At about the same time that the link among the Goodrich deaths was realized, Professor Casare Maltoni, an emminent Italian scientist and Director of the Institute of Oncology, Bologna, Italy, had obtained preliminary results from his experimentation on rats exposed to vinyl chloride monomer. App. 150, 3783, 3962. Prompted by Professor Viola's findings, Professor Maltoni had seen a need to further clarify the type and degree of carcinogenic effects associated with vinyl chloride. App. 3805.

On February 15, 1974, he presented his preliminary data to the Occupational Safety and Health Administration at an informal fact finding hearing looking toward promulgation of an emergency temporary standard on the

hazards of vinyl chloride. App. 150, 3702-3954. [3] In a series of well designed experiments which his scientific colleagues later praised as "exquisite", Dr. Maltoni demonstrated that exposure to vinyl chloride at doses ranging from 10,000 ppm down to 250 ppm elicited multi-site tumors in rats, including angiosarcoma of the liver. App. 72, 150, 3804-3824; Tr. 1306-1307, Supp App. 304-305.[4] Industry spokesman at the hearing recognized the existence of the health hazard and testified that both vinyl chloride monomer plants (VCM) and polyvinyl chloride plants (PVC) could reduce concentrations to below 50 ppm time weighted average. App. 3932-3934, 3940. Dow Chemical Company, which had operated both vinyl chloride and polyvinyl chloride facilities, specifically recommended that the Secretary of Labor should require industry to (App. 3940):

> immediately take steps to reduce exposure [to 50 ppm TWA] by operational and/or engineering changes and require the use of appropriate respiratory protection by his employees likely to be exposed to such levels.

3/ By the time of that informal fact finding hearing, a fourth death from angiosarcoma of the liver had been found among the Goodrich Louisville plant workers. App. 3789, 3854, 3859.

Professor Viola's work had also prompted the Manufacturing Chemists Association to engage the Industrial Bio-Test Laboratories to study the association of vinyl chloride and cancer. However, at the time of the February 15, 1974, hearing, no data from those experiments was available. App. 3830-3832, 3849-3850.

4/ The abbreviation "Supp. App." refers to the Supplemental Appendix filed together with this brief. The transcript citation preceding the supplemental appendix references is to the original record.

B. The Emergency Temporary Standard.

Largely as a result of that February 15 informal fact finding hearing, the Assistant Secretary of Labor on April 5, 1974, promulgated an emergency temporary standard regulating worker exposure to vinyl chloride and lowering the permissible ceiling from 500 ppm to 50 ppm. 39 Fed. Reg. 12342, App. 18-20, 72. He noted that worker deaths, which had stood at four at the time of the hearing, had upon additional investigation been shown to have occurred at Union Carbide and Goodyear plants as well. App. 18. The Assistant Secretary reviewed Maltoni's preliminary data and noted that tumors including angiosarcomas of the liver had been elicited at 250 ppm, below OSHA's then standard of 500 ppm, but that no tumors had been observed at a concentration of 50 ppm, and none either at that level in earlier experiments. App. 18. He concluded that the evidence demonstrated vinyl chloride to be carcinogenic for man, that workers exposed to levels in excess of 50 ppm were exposed to "grave danger", Section 6(c)(1), 29 U.S.C. 655(c)(1), and that the 50 ppm ceiling was the lowest level that could be complied with by industry immediately. App. 18. It was therefore imposed as an emergency temporary standard. Monitoring and recordkeeping requirements were also imposed, as was the requirement that where the 50 ppm ceiling was breached, or expected to be breached, workers were to wear "Type C

continuous flow or pressure demand air supplied respirators or self-contained breathing apparatus." App. 19. The Assistant Secretary specifically noted that (App. 19):

> This standard will be in effect for a period of no longer than six months, during which time the whole question of possible safe exposure of humans to VC will be reconsidered more fully and in light of more information, including experiments which are under way at this time.

C. The Proposed Standard.

Additional information came quickly. On April 15, 1974, the Industrial Bio-Test Laboratories reported preliminary results that 2 out of 100 mice exposed to vinyl chloride concentrations of 50 ppm for 7 hours a day, five days a week, for approximately 7 months, had developed angiosarcomas of the liver. 5/ App. 21, 73. On May 10, the Assistant Secretary again acted, proposing a more stringent standard on the basis of that information. 39 Fed. Reg. 16896; App. 21-25; Tr. 20-21, Supp. App. 5-6 . Realizing that (App. 21):

> the question of a safe exposure for humans cannot be determined at this time, and may continue as a matter for scientific deliberation for many years [the Assistant Secretary concluded] that it is now necessary to propose to change the 50 ppm level established in the ETS [emergency temporary standard] to as low a level as can be detected * * *.

5/ At 200 ppm four angiosarcomas of the liver were reported, and seventeen liver cancers at 2,500 ppm. App. 73.

The level of worker exposure in the proposed standard was set "at no detectable level, as determined by a sampling method capable of detecting vinyl chloride at concentrations of 1 ppm with an accuracy of 1 ppm ± 50 percent." App. 21. That level was to be reached through "the institution of engineering controls and work practices as soon as feasible." App. 21. Respiratory protection, which did not attack the basic problem of vinyl chloride laden workplace air, was to be afforded where engineering did not achieve the goal. App. 21, 23. The proposed standard also amplified previous monitoring and recordkeeping requirements, and proposed a comprehensive standard to deal with worker exposure to vinyl chloride. App. 21-22.

On May 24, the Assistant Secretary noticed the proposed standard for hearing, a hearing which extended for eight days between June 25 and July 11. 39 Fed. Reg. 18303, App. 1. The testimony given, the exhibits introduced, and the post-hearing comments which were received until September 25, form the record on which the Secretary acted in promulgating the vinyl chloride standard. 6/ 39 Fed. Reg. 33009, App. 2.

6/ The record on which the Assistant Secretary acted also includes the facts elicited at the February 15, 1974 hearing, and the other materials we have drawn upon in the preceding pages of this brief such as the emergency temporary standard and the proposed standard. See Certification of Record.

D. The Final Standard.

The final standard was promulgated on October 1, 1974, to become effective January 1, 1975. Until that effective date, the emergency temporary standard (re-promulgated for the interim period) is governing. 39 Fed. Reg. 35890-35898, App. 1-9.

The final vinyl chloride standard is fully justified by the facts of record. Before turning to those facts, we summarize the Assistant Secretary's reasons for promulgating the standard, and set forth its basic provisions.

1. The Reasons.

(a) Carcinogenicity.

Vinyl chloride is a potent human carcinogen. App. 3890-3891. Workers engaged in its polymerization and in its fabrication have died from exposure to it. Tr. 24-30, Supp. App. 7-13 . Rats and mice have both developed multi-site tumors from exposure to the lowest concentration yet tested -- 50 ppm -- a concentration below that customary in VCM and PVC plants, and far below the 500 ppm ceiling which was permissible under governmental regulation until April 5, 1974. 7/ Tr. 1736, Supp. App. 379 . That it must be regulated as a potent human carcinogen is clear. App. 1-2:

7/ Hamsters have developed multi-site tumors at higher concentrations. App. 1-2.

> There is little dispute that VC is carcinogenic to man and we so conclude. However, the precise level of exposure which poses a hazard and the question of whether a "safe" exposure level exists, cannot be definitively answered on the record. Nor is it clear to what extent exposures can feasibily be reduced. App. 3.

(b) Exposure Levels.

The Assistant Secretary reasoned that he could not "wait until indisputable answers to these questions are available, because lives of employees are at stake." It was his opinion that (App. 3):

> the demonstration of cancer induction in humans at a particular level is not a prerequisite to a determination that a substance represents a cancer hazard for humans at that level. It would be imprudent to assume man to be less sensitive to VC than experimental animals in the absence of conclusive evidence.

Indeed it was known that for simply toxic chemicals, a safety factor of 100 to 1 based on animal experiments is considered sensible. Tr. 30, 51-52, Supp. App. 13, 28-29. It was also known that cancer has a long latency period, that its onset may be triggered by accumulated exposure to a carcinogen over a lengthy period of time, and that present epidemiological surveys of vinyl chloride workers have little value in indicating the absence of risk at a particular exposure limit because of cancer's long latency period. App. 1-3.

Thus, in light of the carcinogenic hazard, and in setting the standard's exposure level, the Assistant Secretary gave "overriding consideration [to the] protection of employees, even those who may have regular exposures to VC throughout their working lives." App. 3. This statutory obligation to assure that no employee will suffer material impairment of his health from exposure to vinyl chloride for the period of his working life, was then balanced against his additional obligation to temper the standard by considering questions of technical feasibility. 29 U.S.C. 655(b)(5); App. 3.

(c) Engineering Feasibility.

The Assistant Secretary reviewed the tri-partite structure of the industry -- monomer production (sometimes referred to as VCM or VC), polymer production (PVC), and fabrication. After assessing the evidence he concluded that (App. 3):

> There is virtually no dispute that most, if not all, fabricators are currently capable of reaching levels of 1 ppm through engineering controls. These employers employ well over 95 percent of all employees exposed to VC. Indeed several fabricators are already operating at this level.

He also noted that (App. 3):

> [I]ndustry spokesman have universally claimed that it is infeasible for the VC and the PVC industries to remain below 1 ppm consistently, using

engineering controls. In addition, the Snell study on technical feasibility concluded that a 1 ppm ceiling is not feasible for the VC and PVC industries with present technology, but that the VC industry could currently attain lower exposure levels than the PVC industry. Labor union spokesmen and the Health Research Group, Inc., however, have suggested that such a level is attainable.

The Assistant Secretary reasoned that (App. 3):

> Since there is no actual evidence that any of the VC or PVC manufacturers have already attained a 1 ppm level or in fact instituted all available engineering and work practice controls, any estimate as to the lowest feasible level attainable must necessarily involve subjective judgment. Likewise, the projections of industry, labor, and others concerning feasibility are essential conjectural. Indeed, as Firestone has suggested, it is not possible to accurately predict the degree of improvement to be obtained from engineering changes until such changes are actually implemented.
>
> We agree that the PVC and VC establishments will not be able to attain 1 ppm TWA level for all job classifications in the near future. We do believe, however, that they will, in time, be able to attain levels of 1 ppm TWA for most job classifications most of the time. It is apparent that reaching such levels may require some new technology and work practices.

(d) Respirators.

The Assistant Secretary recognized that the 1 ppm permissible exposure level he was establishing would require the large scale use of respirators for a

considerable period of time in view of the absence of current technology to reach the 1 ppm level by feasible engineering and work practice controls for all workers. He explicitly stated (App. 4):

> that many employers covered by the standard can not currently achieve compliance with the permissible exposure limit solely by the use of feasible engineering and work practice controls.

He noted industry's argument that a 1 ppm exposure limit "would effectively require continuous wearing of respirators in PVC and VC plants, and that this is not feasible because respirators are cumbersome, present a safety hazard, and employees would not use them." App. 5. Although the Assistant Secretary agreed with industry that respirators have many drawbacks, those drawbacks did not override the clear need to take protective action against the carcinogenic hazard of vinyl chloride. App. 5.

> We would agree that respirators have many drawback; the proposal did not contemplate them as a final solution. The record shows that the PVC industry particularly may need several years before plant environmental levels can be reduced so that respirators are necessary only occassionally. However, we cannot agree that respiratory protection should not be required simply because it is inconvenient, may require additional personnel, interferes with production, or may require extensive restraining of employees and restructuring of work practices. We have carefully considered all the objections, and have concluded that if the environmental level is not controlled to the permissible exposure limit, then employees must be afforded respiratory protection.

> While exposures in excess of the permissible level do constitute a hazard, we believe that it is necessary to mitigate some of the problems associated with implementing a program of respiratory protection while employees are being fitted and trained in respirator use, and while other adjustments which may be required are implemented. Therefore, until January 1, 1976, where exposures are not in excess of a 25 ppm ceiling, each employer must provide each employee with an appropriate respirator. However, employees whose exposures do not exceed a 25 ppm ceiling, may decline to use the respirator, in which case the employer is not obligated to require its use. During this adjustment period, employees will be trained in the uses, purposes and limitations of respirators, and the hazards of exposure to vinyl chloride.

The Assistant Secretary's choice of respirators followed closely the suggestions made by Dr. Hyatt, an OSHA consultant. The Assistant Secretary also noted that within the very near future, the least burdensome respirator would in all probability be approved for workplace use.

App. 5:

> Recently, OSHA has received respiratory data from laboratories regarding the effectiveness of commercially available canisters and cartridges for vinyl chloride. These evaluations were conducted separately by NIOSH and by the B.F. Goodrich Company and submitted to OSHA in post hearing comments. The results indicate that certain presently available canisters and cartridges effectively absorb vinyl chloride at relatively low concentrations. In discussions of these findings with NIOSH, it has indicated that it is willing to consider on an expedited basis the approval of

> air-purifying respirators for use against VC. Consequently, we have included three types of air-purifying respirators in the list of acceptable units, subject to the approval of such units by NIOSH. The maximum concentration for which each respirator may be used is based upon our evaluation of the data submitted by NIOSH and Goodrich. Because air-purifying respirators do not indicate sorbent exhaustion or breakthrough of VC, and because VC has no inherent warning properties at levels for which these devices are used, strict administrative controls will be required for their use. Such controls include a program to assure timely replacement of canisters or cartridges and an alarm system to alert employees when vinyl chloride concentrations exceed the concentrations allowed for the particular type of respirator in use.

The final vinyl chloride standard, to which to now turn, is fully responsive to the questions of engineering feasibility and large scale respirator use which the Assistant Secretary addressed, and is responsive as well to his overriding obligation to protect workers against vinyl chloride's carcinogenic hazard.

2. The Provisions.

The final standard applies to the entire vinyl chloride industry, including manufacturers of VCM and PVC, and fabricators. App. 3, 7; 29 C.F.R. 1910.93q(a), (b)(1). It sets as a permissible limit of employee exposure to vinyl chloride no more than 1 ppm averaged over an 8 hour period, and 5 ppm averaged over any period not exceeding 15 minutes. App. 4, 7; 29 C.F.R. 1910.93q(c).

That permissible exposure limit is to be met where possible by "[f]easible engineering and work practice controls [which] shall immediately be used to reduce exposures to at or below the permissible exposure limit." App. 7; 29 C.F.R. 1910.93q(f)(1). The standard provides that (App. 7; 29 C.F.R. 1910.93q(f)(2)):

> Where feasible engineering and work practice controls which can be instituted immediately are not sufficient to reduce exposures to at or below the permissible exposure limit, they shall nonetheless be used to reduce exposures to the lowest practicable level, and shall be supplemented by respiratory protection * * *.

The respiratory protection must be of a kind jointly approved by the Department of the Interior and the National Institute for Occupational Safety and Health. App. 7; 29 C.F.R. 1910.93q(g)(2). The standard itself establishes the type of respirator protection to be utilized. It is keyed to the atmospheric concentration of vinyl chloride in the workplace. (App. 5, 7-8; 29 C.F.R. 1910.93q(g)(4), as amended by 39 Fed. Reg. 41848 (Dec. 3, 1974):

Atmospheric concentration of vinyl chloride	Required Apparatus
(1) Unknown, or above 3,600 ppm	Open-circuit, self-contained breathing apparatus pressure demand type, with full facepiece.
(ii) Not over 3,600 ppm	(A) Combination Type C supplied air respirator, pressure demand type, with full or half facepiece, and auxiliary self-contained air supply; or

Atmospheric concentration of vinyl chloride	Required Apparatus
	(B) Type C, supplied air respirator, continuous flow type, with full or half facepiece, and auxiliary self-contained air supply.
(iii) Not over 1,000 ppm	Type C, supplied air respirator, continuous flow type, with full or half facepiece, helmet or hood.
(iv) Not over 100 ppm	(A) Combination Type C supplied air respirator demand type, with full facepiece, and auxiliary self-contained air supply; or (B) Open-circuit self-contained breathing apparatus with full facepiece, in demand mode; or (C) Type C supplied air respirator, demand type, with full facepiece.
(v) Not over 25 ppm	(A) A powered air-purifying respirator with hood, helmet, full-or-half facepiece, and a canister which provides a service life of at least four hours for concentrations of vinyl chloride up to 25 ppm, or (B) Gas mask, front- or back-mounted canister which provides a service life of at least four hours for concentrations of vinyl chloride up to 25 ppm.
(vi) Not over 10 ppm	(A) Combination Type C supplied-air respirator, demand type, with half facepiece, and auxiliary self-contained air supply; or (B) Type C supplied-air respirator, demand type, with half facepiece; or (C) Any chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least one hour for concentrations of vinyl chloride up to 10 ppm.

Where the standard requires respiratory protection by reason of industry's inability to reach the 1 ppm goal through feasible engineering and work practices, then (App. 7; 29 C.F.R. 1910.93q(g)(1):

> until December 31, 1975, wearing of respirators shall be at the discretion of each employee for exposures not in excess of 25 ppm, measured over any 15 minute period.

The industry is to determine the exposure levels in each plant (without regard to the use of respirators) by a "program of initial monitoring and measurement". App. 7; 29 C.F.R. 1910.93q(d)(1). That initial monitoring is for the purpose of determining whether a possible hazard exists in a particular plant, a concept embodied in the standard's "action level" of 0.5 ppm averaged over an 8-hour work day. App. 7; 29 C.F.R. 1910.93q(b)(1) and (d). If the plant falls at or below the action level, the employer is excused from virtually all further regulation. App. 4.

The standard also sets forth a variety of monitoring, medical, recordkeeping and labeling requirements for the purpose of assuring that workers are cognizant of the hazard of vinyl chloride, that further data on the hazards of vinyl chloride is assembled, and that worker exposure to vinyl chloride is limited consistent with safety. See generally, App. 5-9; 29 C.F.R. 1910.93q(d), (h)-(m). Employers covered by the standard are obligated to develop,

and to submit to the Secretary upon request, a plan (updated at least every six months) to reduce vinyl chloride exposure to the lowest practicable level through feasible engineering and work practice controls. App. 7; 29 C.F.R. 1910.93q(f)(2)-(3).

E. The Evidence of Record.

1. Structure of the Vinyl Chloride Industry.

Vinyl chloride, a gas at ambient temperature and pressure, is the raw material from which the polymer, polyvinyl chloride, is produced. Polyvinyl chloride serves as the basis for a wide variety of useful plastic products. In 1973, over 5.4 billion pounds of PVC was produced in the United States. App. 3264; Tr. 330-331, Supp. App. 115-116 . The vinyl chloride industry divides into three segments -- production of the monomer (VCM), production of the polymer (PVC), and fabrication. App. 1, 3264, 3482-3501.

The industry, in its vinyl chloride and PVC portions, is closely knit and capital intensive. Its 5.4 billion pound PVC production was accomplished with only 6,500 employees -- 1,500 in vinyl chloride production, the most automated segment of the industry, and 5,000 workers in PVC production. App. 3316-3317, 3465-3467, 3472; Tr. 214, 355, 1115, Supp. App. 73, 118, 282 . A limited number of plants and companies are involved in these processes --

9 companies operating 14 VCM plants, and 21 companies operating some 37 PVC plants. App. 3463, 3469; see also App. 3264, 3300-3301; Tr. 330-331, 457, Supp. App. 115-116, 130 . In detail, the VCM and PVC industry structure is as follows (App. 3464):

PROFILE OF VINYL CHLORIDE PRODUCERS (VCM)

Major Producer/Location	1974-1975 Nameplate Capacity (1,3) (Million Lbs.)		Process (2,3)
Allied, Geismar, La.		300	Oxychlorination
American Chemical, Watson, Calif.		170	Stauffer Oxychlorination
Conoco, Lake Charles, La.		625	Stauffer Oxychlorination
Dow, Freeport, Tex.	1,400	*180	Dow Oxychlorination
Dow, Oyster Creek, Tex.		*700	Dow Oxychlorination
Dow, Plaquemine, La.		*450	Dow Direct Chlorination
Ethyl, Baton Rouge, La.	450	*270	Direct Chlorination
Ethyl, Houston, Tex.		*150	Direct Chlorination
Goodrich, Calvert City, Ky.		1,000	Goodrich Oxychlorination
Monochem, Geismar, La.		350	Acetylene
PPG, Guayanilla, P. R.	900	*500	Oxychlorination
PPG, Lake Charles, La.		*300	Oxychlorination
Shell, Deer Park, Tex.	1,500	*800	Stauffer Oxychlorination
Shell, Norco, La.		*700	Stauffer Oxychlorination
Total		6,695	
Correcting for 90% operating level		670	
Subtotal		6,025	
5% lost in polymerization		300	
Subtotal		5,725	
Estimated 1974 exports		300	
Estimated 1974 imports		Negligible	
Subtotal		5,425	
Other uses of VCM		200	
Total available for PVC conversion		5,225	

* Order of magnitude values

Sources: (1) Company and industry totals based on Modern Plastics, May, 1974 and plant site estimates based on Chemical Marketing Reporter, 17 September, 1973, and industry interviews.
(2) Industry Interviews.
(3) Snell assessment.

App. 3473-3476:

PROFILE OF POLYVINYL CHLORIDE PRODUCERS (PVC)

Company	Number of Plants	1974 Company Nameplate Capacity (Million Lbs.)	Share of Total Capacity at mid 1974 (per cent)	Accumulated Percent
B.F. Goodrich	5	1080	19.9%	19.9%
Firestone	2	505	9.3	29.2
Conoco	2	465	8.6	37.8
Union Carbide	2	400	7.4	45.2
Borden	3	385	7.1	52.3
Diamond Shamrock	2	350	6.4	58.7
Robintech	1	250	4.6	63.3
Tenneco	3	235	4.3	67.6
Air Products	2	205	3.8	71.4
Goodyear	2	200	3.7	75.1
Hooker	2	195	3.6	78.7
Ethyl	1	180	3.3	82.0
Stauffer	1	160	2.9	84.9
American Chemicals	1	160	2.9	87.8
Pantasote	2	155	2.9	90.7
Olin	1	150	2.8	93.5
General Tire	1	125	2.3	95.8
Uniroyal	1	120	2.2	98.0
Great American	1	70	1.3	99.3
Keysor-Century	1	35	0.6	99.3
National Starch	1	10	0.2	100.1% (1)
	37	5,425	100.1% (1)	

Note: (1) Does not add to 100% because of rounding errors.

Source: Exhibit III - 4 and Snell estimates.

See also, App. 3301, 3309-3310; Tr. 110, 330-331, 457, 696-703, 781-782, 868, 1029, 1114, 1483, 1681, 1824-1825; Supp. App. 59, 115-116, 130, 175-182, 215, 257, 281, 348, 371, 390-391.

The remaining segment of the vinyl chloride industry, fabrication and processing, is the most diverse. It employs

hundreds of thousands of workers in thousands of plants to compound, process and fabricate PVC resin into a wide range of finished or semi-finished useful plastic products. App. 549, 3298, 3320-3326, 3495-3501; Tr. 653, 682, Supp. App. 165, 171.

2. Methods of Manufacture.

(a) VC Monomer Plants (VCM).

Vinyl chloride monomer production resembles the workings of an oil refinery. App. 3300-3307, 3507-3510; Tr. 698, 1423, Supp. App. 177, 326 . A typical VCM production plant consists of an island of process units, principally fractionation and similar towers, cracking furnaces, and sometimes compressors.[8/]

The plants are outdoors and operate as a continuous closed system. The newer plants are spread over acres of space and are highly automated, with workers spending much of their time in the control room far removed from the actual production units. Normally there is little need for the workers to be physically present in the production area. App. 1037-1044, 1049-1050, 3300-3307, 3407-3514; Tr. 698, Supp. App. 177. The highest risk of exposure to vinyl chloride is in maintenance work and while disconnecting

---

8/ The preferred method of vinyl chloride manufacture production, is through oxychlorination. App. 3303-3305; 3511-3514. Storage is provided by Hortonspheres which are located in tank farms and connected to loading racks where tank cars are filled. App. 3507.

transfer lines during the loading of vinyl chloride into railroad tank cars for shipment to PVC plants. App. 3307, 3508-3509; Tr. 1423-1424, Exh. B-102(1) through 107 to Snell Report, Supp. App. 326-327, 508-527.

(b) Polyvinyl Chloride Plants (PVC).

Virtually all vinyl chloride is polymerized into polyvinyl chloride resins. 9/ Generally speaking, the process is as follows:

Typically, the vinyl chloride arrives at the PVC facility by rail in a tank car. Transfer hoses are attached, and the vinyl chloride is piped into storage tanks with a compressor. From there, it is pumped to a weigh tank where it is measured and readied for pumping to a reactor with the other ingredients necessary for polymerization. App. 1829, 3308, 3525, 3532.

Unlike VCM production, the polymerization process is a batch or discontinuous chemical process. App. 3314:

> This process is essentially a batch process carried out in glass-lined reactors having a capacity of 2,000 to 6,000 U.S. gallons. Monomer soluble initiators, such as lauroyl, decanoyl, and benzoyl peroxides, are dissolved in liquid monomer dispersed in water to form a suspension. The reactor is first charged with the required amount of deionized water. Then the dispersant, a buffer, and the initiator are added. Oxygen is evacuated from the reactor, and the vinyl chloride and comonomer are fed in. Agitation (to increase the degree

9/ As many as 36 different resins are manufactured. Tr. 743, Supp. App. 190.

> of dispersion) is begun, and the contents of the reactor are brought up to the polymerization temperature (45°-60°C). After the ten to sixteen hours of the polymerization process, the contents of the reactor (the PVC slurry), are dumped into a large vessel and excess vinyl chloride is recovered for distillation and reuse [through a process known as "stripping"].

The mixture of granular PVC in water is called slurry. After being stripped of unreacted vinyl chloride it resembles white sand in water. Drying is accomplished by a centrifuge which separates the water leaving a wet resin powder, which itself is fed through a rotary dr er until the resin is a dry, free flowing white powder similar to sugar. 10/ The resin is then conveyed by tubes to storage silos, and from there by trucks or rail to compounders and fabricators. App. 1830, 3314, 3520, 3523-3527, 3600.

The high risk job classifications in PVC manufacture include those workers who when vinyl chloride is received by tank car, hook and disconnect the transfer hoses, the employees who open and clean the reactor vessel after the polymerization process, and those engaged in stripping, drying, and maintenance work. App. 3316-3320, 3578, Tr. 698-701, 796, 814-815, 1117-1127, 1424-1431, 1445-1447, 1451-1454, 1458-1460, Supp. App. 177-180, 202, 207-208, 283-394, 327-334, 335-339, 340-343, 344-346.

10/ PVC resin is manufactured by four different processes -- suspension polymerization, emulsion polymerization, bulk polymerization, and solution polymerization -- but by far the customary practice, and the one which accounts for 78 percent of PVC resin production, is the suspension process. It is described in the text. App. 3311-3316, 3523-3532.

Unlike VCM plants which are open air facilities and located primarily in the warm outdoors of the South and West, PVC plants are located throughout the United States and are open only in part. 11/ App. 1038-1042, 1046, 3417-3418, 3464, Tr. 696-698, 1124, 1126, Supp. App. 175-176, 290, 292.

(c) Fabricators.

Processing and fabrication of PVC resins into semi-finished or finished products occurs in literally thousands of workplaces. PVC resins are compounded with additives such as plasticizers to increase resin flexibility, heat stabilizers to prevent discoloration, lubricants to reduce friction, light stabilizers to prevent PVC degradation from continuous exposure to sunlight, and flame retardants and impact modifiers. App. 3320-3324. The compounding processes are varied; the PVC resin and additives can be kneaded by a two-roll mill, pressurized and heated in a Banbury mixer, fed into continuous mixers or high speed mixers, or compounded into a plastisol paste. App. 3322-3324. Fabrication of finished or semi-finished products can be accomplished by extruding the PVC blend through a die and forcing it into a variety

---

11/ The distribution of PVC plants by State is set forth at App. 3417-3418. It shows 26 plants located in moderate to cold climate regions and 10 in a warm climate. The VCM plants are located in Louisiana, Texas, California, Kentucky and Puerto Rico. App. 3464.

of shapes; by producing a homogenous melt which is then injection-molded at high pressure, by blow molding, compression molding, calendering the powder into rigid sheets, spraying it to a frothy foam, or coating fabrics, sheet steel and paper with a plastisol paste, and heating it until fused. App. 3326-3329.

However, worker exposure to vinyl chloride at the fabrication stage is limited. Basically, whatever exposure there is, arises from the escape of the residual VC monomer entrapped in the PVC resin. Since the entrapped vinyl chloride is limited and escapes at its fastest rate when heated, the highest risk of worker exposure occurs during the heating process and is invariably brought within permissible bounds by increased ventillation. App. 3329-3330, Tr. 204-206, 289-293, 356, 636-638, 642, 645-651, 668-669, 674, 677-678, 794, 1192, 1406-1407, 1416-1421, 1470, 1542, 1543, 1586-1591, 1604-1606, 1629-1631, 1664-1665, 1671, Supp. App. 70-72, 88-92, 119, 154-156, 157, 158-164, 166-167, 168, 169-170, 201, 301, 318-319, 320-325, 347, 355, 356, 357-361, 362-364, 365-367, 368-369, 370.

3. Industry's Response to the Hazard of Vinyl Chloride.

(a) The Commitment.

Industry's response to the hazard of vinyl chloride is still in its incipient stages, but the leading VCM and PVC producers, as well as the spokesman for the Society

of Plastics Industry (SPI, an industry trade association representing the Plastic's industry at large), have vowed a commitment to protect their workers by using their best efforts to reduce vinyl chloride exposure to the lowest practicable and feasible level. Thus, Dow Chemical operator of three VCM plants and 1 PVC copolymer plant (App. 1038, 3464; Tr. 1022, Supp. App. 251):

> Mr. Oelfke: It has been our position in the years gone by that we reduce our exposures to all chlorinated hydrocarbons to the lowest possible limits.
>
> Mr. Samuels: Do you think that the rest of the industry ought to do at least as well as you do in these operations.
>
> Mr. Oelfke: I cannot testify to the rest of the industry. I am speaking of Dow's philosophy.
>
> Mr. Samuels: I don't mean what they can do but what they should do.
>
> Do you think they ought to be making the same effort?
>
> Mr. Oelfke: I think unnecessary exposure to any foreign material is a bad thing.
>
> * * * * *
>
> Mr. Samuels: Do you feel that there should be exposure up to the SPI recommendations even though it is not necessary?
>
> Mr. Oelfke: We do not feel that the ten parts per million as suggested by the SPI has [sic] a license to operate at 10 parts per million on a TWA.
>
> In fact, we feel like it should be considerably lower than that on an average in order to insure that you will be below ten parts TWA in a VCM manufacture. Tr. 921-922, Supp. App. 224-225.
>
> * * * * *

Mr. Klein: If the level, for example, was going to be set at one ppm, say, two or three years from now, would you go about reaching that level differently than you would if the level was set at 5 ppm?

Mr. Oelfke: I doubt it very seriously. We have to find out where our problem areas are. And we have attempted to do so at the present time.

Tr. 902-903; Supp. App. 222-223. (Emphasis added.)

Dr. Gehring of Dow Chemical testified to the same effect:

Mr. Heckman: Do you feel that the SPI proposal is reasonable, taking into account the state of the art in the industry, and your evaluation of the safety data at hand at the moment?

Dr. Gehring: I'm going to say this just a bit differently. And I suspect this is the answer. There are numerous things involved in setting any level, worker, jobs, foreign trade, technology for a particular plant, and so on.

In my opinion, if I examine the toxicological data available, as well as the human data which has been shown here, there is not any discernible indication or any, at least, specific indication that 50 parts per million, for example, constitutes an unreasonable risk.

That is not to say that if the technology -- being a toxicologist, I would want people to do whatever they can to lower the risk. So I think the thing is, is that if you have the technology to reduce that level, and to get down further, that is only prudent and makes good sense.

Tr. 1023-1024, Supp. App. 255-256 .

Diamond Shamrock, operator of 2 PVC plants with 8 percent of industry's capacity testified (Tr. 1029-1030, 1038-1039, Supp. App. 257-258, 262-263):

Mr. Connors: * * * First, we are concerned about the health and welfare of the workers in our plants, and we want to do all that we can to insure that our employees are not subjected to any undue hazards in connection with their employment.

* * * * *

We endorse the gradual reductions in VCM levels as proposed by SPI. In addition, as a prudent corporation, we are hopeful that we will be able to reach those levels in a shorter period of time, and we intend to do all that we can to attain even lower levels of exposure.

And Mr. Antone Vittone, President of B.F. Goodrich, operator of 1 VCM facility and 5 PVC plants, answering both for Goodrich and for the industry at large in his capacity as Chairman of the Society of Plastic's Industry Committee on Vinyl Chloride Monomer and Polyvinyl Chloride Producers (App. 3464, 3473-3476, Tr. 350, 1186-1187, Supp. App. 117, 299-300):

Mr. Hechman: Jerome H. Hechman, General Counsel, Society of the Plastic Industry. Mr. Vittone, I just want to be clear on B.F. Goodrich's position, and in the sense, also SPI's, and you are in a position to answer for both.

Is it not your position that the B.F. Goodrich is spending what it is spending on improving the contaminent situation within the limits of technical feasibility and without regard for whether or not there will be savings on such matters as workmen's compensation and that type of thing?

Mr. Vittone: That is correct. As I stated earlier, we do not claim economic feasibility. If we have the feasibility for doing it, we are doing it.

Mr. Hechman: Are you doing everything you can do within your technical capabilities?

Mr. Vittone: That is correct.

Mr. Hechman: Is it your understanding also that the SPI position with respect to economic feasibility is that a tolerance should not be set that would put the industry out of business, and, therefore, would create greater economic impact throughout the economy?

Mr. Vittone: That is correct.

Mr. Hechman: And that is the basis of the the economic position?

Mr. Vittone: That is correct.

(Emphasis added.) 12/ The commitment then has been given. It is to use industry's best efforts to reduce vinyl chloride exposure to the lowest practicable and feasible level.

(b) The Initial Efforts.

Since the carcinogenic hazard which workers face through exposure to vinyl chloride has been realized for less than one year, industry's efforts to guard against the hazard are still in the incipient stage. Moreover, industry's response has not been all of a piece.

12/ Even Firestone Plastics Company, which in its Brief, pp. 72-75 raises the economic feasibility issue, at the hearing testified (Tr. 1682, Supp. App. 372):

> that every technologically feasible method that can be employed to protect the people involved in the industry must be adopted.
>
> Firestone is committeed to expend all the capital necessary for the research, development, and implementation

(Footnote continued)

(i) VCM Plants.

Among VCM manufacturers Dow Chemical has undertaken the most significant effort thus far. Very early on, when in 1958 and 1959 Dow Chemical research scientists found that vinyl chloride at concentrations as low as 100 ppm could cause liver irregularities in rats and rabbits, Dow set a 50 ppm time weighted average exposure limit for its own workers. Tr. 232-235, Supp. App. 81-84. Operating with the stated philosophy that exposure to any chlorinated hydrocarbon is a bad thing and should be reduced to the lowest possible limits, Dow Chemical has designed its newer VCM facilities with exposure reduction in mind. Tr. 902-903, Supp. App. 222-223 .

The trend has been to larger capacity equipment sited more expansively. With the spread over space, congestion is minimized, the control center is placed at an increased distance from the process area, and the likelihood of worker exposure to vinyl chloride in the production process is considerably reduced. Larger pieces of equipment, the move to what is called a production train rather than many trains finds justification not merely as a matter of economics, but from a health standpoint as well, since fewer parts present an opportunity for fewer fugitive leaks. App. 1038-1042.

12/ (Cont'd.)
of those procedures which will reduce employee exposure to vinyl chloride monomer to the lowest technologically feasible level. (Emphasis added.)

See also, App. 1717-1718, 1779, Tr. 1726-1727, 1748-1750, Supp. App. 377-378, 381-383.

With the discovery of the carcinogenic hazard Dow Chemical undertook further efforts to reduce worker exposure to vinyl chloride. Extensive monitoring was instituted to identify the sources of vinyl chloride emission. Tank car loading practices, a significant leakage source, were altered. Magnetic gauging devices are being secured and installed on the cars to prevent what would otherwise be a short-lived vinyl chloride fog as the tank car opening was visually inspected to ensure that it had been filled to capacity. App. 1043-1044. In-plant monitoring has revealed other problem areas as well, and new procedures have been instituted to correct them, such as utilizing a closed loop system for purging vinyl chloride emissions when taking quality control samples, and installing vapor recovery units to return vinyl chloride streams to process, when maintenance work must be performed. App. 1044-1046. Alarm systems have also been installed to detect major leaks and spills should they occur. Tr. 877, Supp. App. 216 .

This effort has already resulted in a significant reduction in worker exposure to vinyl chloride as is borne out by Dow Chemical's monitoring data. Exhibit 24, Elements for Comprehensive Vinyl Chloride Surveillance Program, Tables I-VII, Supp. App. 395-401. In its newest plant, constructed in 1969, the average exposure has been reduced to 1.2 ppm and the problem areas readily identified.

Less than 1% of the measurements were above 11 ppm. Tr. 887, Supp. App. 217 . Even in its older facilities, average vinyl chloride exposures are below 3 ppm. Tr. 887, Supp. App. 217 ; see also Tr. 234, Supp. App. 83.

Other VCM operators have also reduced workers exposure to vinyl chloride. Tenneco reported that its small VCM facility has average concentrations ranging between 10 ppm and 0 ppm. Tr. 712, 750, Supp. App. 185, 194 . Goodrich, like Dow Chemical, is installing magnetic level indicators on its fleet of tank cars, and in the first five months of 1973 assigned 135 scientists and technicians at its research and development facilities and in its plants to work on process and product improvements directed at lowering vinyl chloride losses and reducing exposure. Tr. 1124-1125, Supp. App. 290-291 . The Snell Report tabulates and summarizes the generally low, but nevertheless variable vinyl chloride exposure levels which have already been obtained by some of the VCM operators. Exhibits B-100-B-105(4), B-107 and B-108 to Snell Report, Supp. App. 505-528.

(ii) PVC Plants.

The PVC segment of the vinyl chloride industry is more diverse and the responses to the threat of vinyl chloride exhibit wide variation.

Uniroyal Chemical, with 3% of the PVC market, has not made any equipment changes to reduce worker exposure to vinyl chloride, other than to offer its employees respiratory equipment. It had not committed itself to the purchase of any major equipment, and would not, until the final standard had been promulgated. Tr. 1483, 1511-1513, Supp. App. 348, 350-352.

Air Products and Chemicals, Inc., producer of 200 million pounds of PVC with 3.5 percent of industry capacity, ranking 10th, began work on reducing employee exposure to vinyl chloride in early 1974, and within three months had reduced its concentration from an average of 200-400 ppm to below 50 ppm. Tr. 781-782, 796-797, Supp. App. 195-196, 202-203 . It extensively revised its operating procedures to reduce the chance release of VCM inside its plant, retrained operators, augmented its total ventillation system, and instituted the use of air-line respirators for workers engaged in reactor cleaning and maintenance. Tr. 796-797, Supp. App. 202-203. However, the company also noted that its effort, and that of the industry generally, had been limited to the quickest and easiest steps. Tr. 790-791, Supp. App. 199-200.

Tenneco Chemicals, Inc., with approximately 4.3% of industry capacity (not including an additional plant under construction), has, like Air Products, reduced vinyl chloride exposure from approximately 200 ppm to

an average in some areas of between 25 ppm and 30 ppm. App. 3473-3476, Tr. 717, Supp. App. 187 . The company has improved its ventillation and stripping systems, undertaken monitoring, given more maintenance to leaky equipment, and is evaluating the possibility of installing different valves which would leak less or not at all. Tr. 708-709, 716-717, Supp. App. 183-184, 186-187. In areas where vinyl chloride concentrations exceed 25-30 ppm the company supplies its workers with respirators. Tr. 717, Supp. App. 187 . For this purpose a manifold air-supplied system has been installed to completely cover all of the reactor building areas at all levels, as well as other necessary plant areas, and each worker has been issued a full-face air supplied respirator for use when necessary. Tr. 708-709, Supp. App. 183-184. In its new plant under construction, which will more than double the capacity offered by Tenneco's three existing plants, Tenneco has incorporated improved reactor cleaning technology and more up to date engineering practices. App. 3473-3476, Tr. 696-697, 1712, Supp. App. 175-176, 376.

Diamond Shamrock Chemical Company, operator of 2 PVC plants with approximately 8% of industry capacity, began its efforts to reduce worker exposure to vinyl chloride in June, 1973. Tr. 1029, 1053, Supp. App. 257, 268. Within a matter of months, by March, 1974, the company had reduced worker exposure to an average of 5 ppm TWA

in its 20 year old plant, and a range of less than 1 ppm to a high value of 26 ppm. Fifty-three of the sixty six samples taken were less than 10 ppm. Tr. 1029, 1064-1066, Supp. App. 257, 269-271 . In its newer but more northerly plant, which produces one particular resin difficult to deal with, Diamond Shamrock by mid-1974, had nevertheless reduced worker exposure to a 25 ppm average, and a range of from 2 ppm to 138 ppm. Tr. 1029, 1064-1066, 1069, Supp. App. 257, 269-271, 272 . The company now meets the 50 ppm ceiling which was imposed under the emergency temporary standard and can implement further reductions. Tr. 1032, Supp. App. 259 . In the last year, Diamond Shamrock stated that it has spent $3 million in capital improvements to reduce worker exposure to vinyl chloride. Tr. 1032-1032A, Supp. App. 259-260. It has re-routed process vents into non-occupied areas, significantly modified its reactor entry procedures, installed an improved reactor purging procedure prior to worker entry, and has licensed Goodrich's hydraulic cleaning system. The company has also improved its vapor recovery systems to comport with Texas' Air Control Board requirements, and has added new gas holders, compressors and condensers. Tr. 1072-1074, Supp. App. 273-275 . In one of its plants it has placed 25 percent of its workers in respirators for a portion of the day. Tr. 1075, Supp. App. 276 .

Firestone Plastics Company which operates 2 PVC plants, ranks 2d, and produces 9.3 percent of this country's PVC, had represented to OSHA in early 1974 that it would be virtually impossible even to reach the emergency temporary standard's 50 ppm ceiling requirement. App. 3473-3476, Tr. 1681, 1818, Supp. App. 371, 389. Nevertheless, a few months later, by the time of the hearing on the proposed standard, Firestone stated that it was in compliance with that 50 ppm ceiling. App. 1704, 1787. Thus far, Firestone has committed itself to implement a medical surveillance program and has placed a purchase order for a constant sequential monitoring system to be employed at its two plants. Tr. 1685, Supp. App. 373. It also has improved ventillation and introduced a high pressure water system to clean some of its reactors. App. 1704.

What additional measures Firestone has taken is difficult to determine because of the contradictions in Firestone's submission. Although the company stated that it was in compliance with the 50 ppm ceiling of the emergency temporary standard, it was unclear by what methods Firestone had achieved what a few months earlier had been a virtual impossibility. Most likely it had been through the combined use of respirators, work practices, and engineering, but it is by no means easy to decipher.

For example, while Firestone testified that it had "posted" eight separate areas of its Pottstown plant for air-supplied respirators, it was unclear whether this posting meant that respirators were actually in use. Tr.1737, Supp. App. 380. Presumably they were in use, but then if that assumption were correct it was difficult to understand how Firestone in the same prepared submission could state that in order to reach the already reached 50 ppm ceiling it would be necessary to purchase 60 air supplied respirators for its reactor operators, stripper operators, relief operators, area fitters, utility and servicemen, lab sample men and foreman. App. 1814. And if those respirators were in fact already in use, it was difficult to understand why Firestone stated that it would take 10 weeks to procure them. App. 1814.

Perhaps then, Firestone's accomplishment of the virtually impossible had been achieved through engineering and capital investment. But here too there were disturbing contradictions. At one point in its prepared submission Firestone's consultant stated that it would require a $10 million capital investment to meet the 50 ppm ceiling. App. 1885. Surely, if this money had been spent, Firestone would have made explicit mention of it. Yet the company talked not of millions already spent but of the purchase order which it had placed for

monitoring equipment. Tr. 1685, Supp. App. 373. Then again, the $10 million capital cost to reach the already reached 50 ppm ceiling dropped at another point in the prepared submission to $6.7 million which included $1 million simply for contingencies and escalation at one plant. App. 1752, 1816-1817. 13/ The Snell Report states that Firestone's cost projections were consistently high, compared to the rest of industry. App. 3553. No doubt much of the confusion surrounding the inherent contradictions in Firestone's submission stems from its house counsel's refusal to provide hearing counsel with a copy of the prepared testimony, thus effectively precluding useful cross-examination. 14/

Conoco, the third ranking producer of PVC did not testify, but advised the Snell consultants that over a 3 year construction period it plans to replace the small

---

13/ Capital changes to reach the 50 ppm ceiling of the emergency temporary standard were given as $5 million for the Pottstown plant and $1.7 million at Perryville. App. 1752.

At another point Firestone stated that to achieve present levels (which presumably meant compliance with the 50 ppm emergency temporary standard ceiling) there was no capital cost involved whatsoever, at least for one of its plants. App. 1869. This no doubt was simply a failure to recall that at "present" there was in fact a 50 ppm ceiling governing.

14/ The following discussion took place (Tr. 1678, Supp. App. 370A):

> MR. KLEIN: Excuse me, your Honor. May I make a request? I notice that the Firestone presentation is rather voluminous. If we could have a copy or two before the presentation.
>
> JUDGE MYATT: Do you want to give it to him, Mr. Connolly, or do you want to be your usual kind self --
>
> MR. CONNOLLY: No, we don't want to give it to them. I would have given it to them if you hadn't said that.

(Footnote continued)

reactors in its oldest plant with much larger reactors, and anticipates very significant reductions in vinyl chloride concentrations as a result (App. 3612-3613):

> A new Concoco PVC plant based on the large reactor technology came on stream in 1971 in Oklahoma City, Oklahoma. Concoco also operates a small reactor PVC plant in Aberdeen, Mississippi . . . . Approximately 32 to 34 small 2200 gallon reactors are needed to provide the same capacity that is obtained in 4 large reactors at Oklahoma City. This means that 8 times as many reactors must be charged, polymerizations contained, stripped, dumped, cleaned, etc. The number of mechanical entities (valves, flanges, pumps, etc.) requiring maintenance (leak problems) is substantially less in the large reactor plant, a strong positive factor in its favor. Moreover, most of the mechanical steps in the new plant are carried out by remote control....
>
> Most of the small reactor plants have been constructed with the reactors contained in buildings. Our large reactor plant has only a roof over the reactor building. The associated piping, instrumentation, etc. are enclosed on the sides by a protective metal screen-like structure which covers only about two-thirds of the vertical rise. Therefore, the reactor area is essentially "open-air".
>
> The large reactor technology, when producing construction type resin, requires personnel entry only about once every thirty days; in small reactors, entry for cleaning is about every 4 or 5 days. Reduced entry frequency is

---

14/ (Cont'd.)
(Laughter)

JUDGE MYATT: You're consistent.

(Laughter)

(Whereupon at 11:30 a.m. a luncheon recess was taken.)

> obviously preferred until the goal of zero personnel entry can be achieved by additional research on "clean wall" polymerization formulations. Until that time a combination of solvent cleaning followed by periodic personnel entry in the reactor to manually chip away polymer will be required.
>
> Our large reactor plant provides about a 98% yield of PVC based on vinyl chloride monomer charged whereas small reactor plant yield is only about 94 to 95%. While the distribution of yield loss is not fully defined, we believe a significant reduction in atmospheric emissions is being obtained. In addition to the differences in product mix, this difference in yield reflects the fact that fewer operational steps are required in large reactor technology which minimizes the loss of both solid PVC and gaseous VCM. This should provide a workplace with a lower risk for the employee of VCM exposure.
>
> Large reactor manpower requirements are approximately one half that of small reactors on an equal production basis.

In other words, just as with the VCM producers, PVC producers reveal a trend to larger production units which is justified both as a matter of economics and from a health standpoint. App. 3473-3476; see supra p.33. The Snell Report details the wide disparity of current vinyl chloride levels in PVC plants which has followed upon the widely divergent degree of effort undertaken by the various PVC manufacturers. Exhibits B-2 - B-24, esp., summary exhibits B-22 - B-24 to Snell Report, Supp. App. 423-504, esp., 502-504.

(iii) Fabricators.

As noted earlier, the compounding, processing and fabrication segment of the vinyl chloride industry is the least susceptible to vinyl chloride exposure. The vast majority of those who testified had already increased ventilation in their plants, thus reducing vinyl chloride exposure to a minimum. See supra, p. 28.

(c) The Effort Required.

As a general matter both the vinyl chloride and polyvinyl chloride producers took the position that with current technology it would not be feasible to meet the proposed standard's requirement that worker exposure be reduced to no detectable level, a judgment concurred in by the Snell Report. App. 3584; but see App. 1938-1939. Nevertheless it is clear from industry supplied data that for many areas and job classifications the 1 ppm permissible level of exposure is already being met. Thus, Dow Chemical's monitoring revealed that the control room, laboratory, loading rack, product tanks, both furnace areas, and all four finishing areas of one VCM plant had average exposures of less than 1 ppm of vinyl chloride. Exhibit 24, Table V, Supp. App. 399. By job classifications, the senior operating technician, day operations, shift supervisors, office personnel, and instrument personnel were all exposed to 1 ppm or less. Exhibit 24, Table IV, Supp. App. 398.

While exposure levels in PVC plants are generally higher, there again is no dearth of evidence to indicate that a 1 ppm level is being achieved in certain areas. Again, monitoring data shows that the lead operator, control room operator, receptionist office, engineering offices, and maintenance shop all had exposures of 1 ppm or less. Exhibits B-5(1) and (2) and B-6(b) to Snell Report, Supp. App. 434-435, 434-441. On an eight hour time weighted average as specified in the Secretary's standard 10 percent of the PVC employees were exposed to 1.2 ppm or less of vinyl chloride. Exhibit B-6(4) to Snell Report, Supp. App. 439 . Similarly, in a more restricted sampling, the break room, locker room, lunch room, main office, warehouse, telex, laboratory and maintenance shop all had values of 2.0 ppm or less. Exhibit B-7(8) to Snell Report, Supp. App. 450 .

To be sure a significant level of effort lies ahead before a 1 ppm time weighted average and 5 ppm ceiling can consistently be achieved through engineering and work practices, especially in PVC plants. However, for PVC manufacturers, reduction of vinyl chloride levels to a 15-25 ppm ceiling and a 10-15 ppm average can probably be accomplished even without further research and development. App. 3563. Moreover, the areas of research and development to achieve still lower levels,

have already been indicated in broad outline. Since opening reactors is a major source of vinyl chloride emission, research and development into automated reactor cleaning is called for. App. 3603-3611. Already, large reactor technology has been developed which significantly increases capacity and reduces reactor cleaning from once every four or five days with a small reactor to once every 30 days with a large one. App. 3612; see also Tr. 814-815, Supp. App. 207-208. So too improvements to the stripping step in PVC production will minimize vinyl chloride exposure in processes downstream from the reactor. To the extent that unreacted VCM can be stripped from the slurry, exposure is reduced in drying and bagging operations, and in the fabrication segment of the industry as well. More sophisticated stripping methods are already under development. App. 3617-3621, Tr. 388-390, Supp. App. 125-127. However, until new technology begins supplying answers to reducing vinyl chloride exposure in the workplace, the use of respiratory equipment offers an alternative method of protection. Before turning to that method of protection, we detail vinyl chloride's risks.

4. The Risks of Vinyl Chloride Exposure.

(a) The Deaths.

Thus far in the United States the deaths of 13 workers, and the ineluctable deaths of two other workers who have already contracted angiosarcoma of the liver, have been

definitively identified as resulting from vinyl chloride exposure. Thirteen of the workers had been employed in four PVC plants, and two in the fabrication of vinyl chloride. In foreign countries, at least six deaths from vinyl chloride exposure have been reported including the death of a VCM plant worker. App. 3277, 3290, Tr. 12, 28, 95-98, 110, 114-117, 119-120, 1690, Supp. App. 4, 11, 55-58, 59, 60-63, 65-66, 374 . The average age at death for the PVC production workers was 48.5 years, about seven years younger than for other liver cancer deaths. Tr. 97, Supp. App.57 . The mortality statistics are as follows (App. 3290):

CONFIRMED CASES OF LIVER ANGIOSARCOMA AMONG WORKERS EXPOSED TO VINYL CHLORIDE OR POLYVINYL CHLORIDE

COUNTRY	CASE #	BIRTH DATE	1st VC or PVC EXPOSURE	DX ANGIO-SARCOMA	AGE AT DX	YRS 1st EXP TO DX	TOT YRS EXP	DATE OF DEATH
VC MONOMER PRODUCTION WORKERS								
Sweden	02	11-27-11	00-00-45	05-15-72	61	27	23	08-16-72
POLYMERIZATION WORKERS								
United States	01	00-00-22	12-09-48	03-00-71	49	22	16	03-03-73
United States	02	00-00-34	11-15-55	05-00-70	36	14	13	09-28-71
United States	03	00-00-15	11-28-45	12-00-73	58	28	28	12-19-73
United States	04	00-00-24	07-06-52	08-00-67	43	15	15	01-07-68
United States	05	00-00-12	06-17-44	04-00-64	52	12	12	ALIVE
United States	07	05-03-22	08-00-44	00-00-68	45	24	18	03-23-68
United States	08	05-06-20	10-07-46	08-00-61	41	15	15	08-29-61
United States	09	00-00-31	05-28-45	03-01-74	43	29	17	ALIVE
United States	10	08-16-13	06-00-51	05-00-68	55	17	17	05-10-68
United States	11	05-27-09	10-14-46	03-00-70	61	23	23	03-16-70
United States	12	11-17-18	09-13-49	05-00-69	50	20	15	05-02-69
United States	13	12-01-21	08-19-44	05-00-74	53	30	30	ALIVE *

COUNTRY	CASE #	BIRTH DATE	1st VC or PVC EXPOSURE	DX ANGIO-SARCOMA	AGE AT DX	YRS 1st EXP TO DX	TOT YRS EXP	DATE OF DEATH
W. Germany	02	06-04-30	10-01-57	00-00-69	39	11	11	01-25-69
W. Germany	02	06-04-30	10-01-57	00-00-69	39	11	11	01-25-69
Great Britian	01	00-00-01	00-00-46	12-00-72	71	26	20	12-00-72
Norway	01	12-23-15	03-00-50	12-20-71	56	22	21	01-04-72
Sweden	01	06-23-27	08-14-51	02-00-70	43	19	18	10-20-70
SECONDARY MANUFACTURING								
United States	14	00-00-13	08-18-38	06-00-73	60	36	00	07-03-73
United States	15	00-00-25	00-00-00	07-00-72	47	00	00	02-15-73

Note: '00' indicates unknown date
DX = Diagnosed
* Died 07-04-74. See App. 3258.

See also App. 3258 which reports 2 possible cases in Czechoslovakia from vinyl chloride exposure.

The causal link between angiosarcoma of the liver and vinyl chloride exposure has been established and is undisputed. Even industry admits that vinyl chloride is a proven human carcinogen, and that exposure to it causes not only liver cancer in man, but very possibly other multi-site cancers in man, as well. App. 1733-1735, 1892, 1904-1906, 2651, Tr. 402, 503-505, 788-789, 827-829, 842, 952-954, 1007, 1023-1024, 1034, 1290-1291, 1306-1307, 1321-1322, 1350-1351, 1515-1516, 1690-1691, 1768-1769, 1775-1776, Supp. App. 128, 139-141, 197-198, 209-211, 306-307, 308-309, 353-354, 374-375, 384-385, 386-387, see also, Tr. 26, Supp. App. 9. Indeed, a study of Firestone's PVC workers revealed a statistically significant

greater than expected mortality rate from lung cancer, digestive cancer, and cardiovascular causes when compared to the total U.S. male population. App. 1733-1734, 1904-1906. Similar findings were reported from studying the deaths of workers at Firestone's tire plant. App. 1904-1906. Moreover, Firestone PVC workers tended to die at an earlier age than either the U.S. male population at large or Firestone tire workers. Again, the differences were statistically significant. App. 1905.

(b) Exposure Levels.

No one knows what constitutes a safe level of exposure to vinyl chloride for man. Tr. 9-12, 30, 60, 94, 129-130, 268, 834, 996, 1023-1024, 1045-1046, 1290-1291, 1321-1322, 1350-1357, 1691, Exhibit 39 D, Supp. App. 1-4, 13, 30, 54, 68-69, 87, 212, 246, 255-256, 265-266, 302-303, 306-307, 308-314, 375, 412-422. Indeed, one industry witness when asked to name an acceptable level of exposure testified that (Tr. 1045, Supp. App. 265):

> I find there's joy in my heart that
> I don't have to make that decision.

No one knows either the precise mechanism by which a cancerous growth is triggered. Tr. 12, 31, 34-44, 956-970, Supp. App. 4, 14, 15-25, 231-245 . Government sponsored research into these questions seems years away from fruition. Tr. 63-64, Supp. App. 31-32 .

What is known is that cancer generally has a long latency period stretching some twenty five years, that it may be caused by an accumulated exposure over many years, and that until the Secretary's April 5, 1974, emergency temporary standard imposed a 50 ppm ceiling on vinyl chloride exposure, the PVC and VCM manufacturers, Dow Chemical excepted, operated at vinyl chloride exposures in the hundreds of parts per million. See supra, pp.8-44; see also Tr. 97, 118, Exhibit 39 D, Supp. App. 57, 64, 412-422. Thus, the vast majority, if not all, of the workers in PVC and VCM plants have been continuously exposed throughout their working lives to levels of vinyl chloride which have proven cancerous in laboratory experiments on animals.

It is also known that when establishing safe levels of human exposure for simply toxic but non-malignant chemicals, it is considered sensible and good practice to specify a safety factor at least 100 times less than the concentration which did not cause any ill effects on laboratory animals. Tr. 30, 43-46, 51-52, 996-997, Supp. App. 13, 24-27, 28-29, 246-247. Some suggestions, including those advanced from industry, recommended that one take the lowest level at which any response occurs and divide that by roughly 5,000. Tr. 44, Supp. App. 25 . With vinyl chloride, a no-effect level has not yet even been demonstrated for laboratory animals, let alone for man.

As Dr. Kraybill of the National Cancer Institute put it (Tr. 30, Supp. App. 13):

> Certainly, there is little margin for safety if a response can be expected at a level below 50 parts per million which in truth is now only a fifty-fold safety factor in terms of the proposed standard. According to toxicological principles, were this compound a non-carcinogen, then to establish a tolerance or safe level, there would have to be a 100 to 1 margin of safety in terms of a no-effect level, and from the experimental data on the animals we don't even know what the no-effect level is. Obviously, this would put the allowable level at a small fraction of a given standard -- of the given standard.

See also Tr. 233-237, Supp. App. 82-86 .

Not only worker deaths, but laboratory experiments have demonstrated the carcinogenic potency of vinyl chloride. Multi-site tumors have been elicited in two strains of rodents at 50 ppm -- the lowest concentration level tested. The latest results of the Bio-Test study, submitted August 16, 1974, revealed that of 200 mice exposed to 50 ppm of vinyl chloride for eleven months, 100 died. Gross post-mortem pathologic examinations were performed for 36 of these 100. Those examinations revealed that 13 mice or 36% had liver tumors including angiosarcomas, 21 or 58% had lung tumors, 9 or 25% had skin tumors, and 1 had a kidney tumor. App. 2724-2725. 15/

15/ Bio-Test also reported that post-mortem examination performed on 133 mice exposed to a mean level of 198 ppm revealed that 102 mice had liver tumors, 91 had lung tumors, 33 had skin tumors and 14 had kidney tumors. App. 2725.

In addition, Bic-Test reported that post-mortem examinations had been performed on 3 rats that had died following exposure to 50 ppm vinyl chloride for a similar period and that 2 of the 3 had liver tumors. App. 2725.

The most recent results of Professor Maltoni's studies reported that of 60 mice exposed to vinyl chloride at 50 ppm for seven months, 9 developed mammary tumors, two had liver tumors, and two had skin tumors. Maltoni further reported that of 64 rats exposed to 50 ppm for one year, one had a liver angiosarcoma, one had an abdominal angiosarcoma, one had a kidney tumor, and one a skin tumor. Tr. 10-11, Supp. App. 2-3 . 16/ Dr. Marcus M. Key of NIOSH looking at the animal data, testified (Tr. 126, Supp. App. 67):

> We are getting down pretty close to zero in the animal effects, and by the time you do establish a valid no-effect level, with a large number of animals, and crank in a safety factor, you're going to be pretty close to zero.

16/ Commenting on the early Bio-Test results first reported on April 15, 1974, Bio-Test Toxicology Manager Dr. Keplinger stated that vinyl chloride "does appear to be carcinogenic in the mouse" and that "the indication is there" that VCM is also carcinogenic in the hamster and rat. Tr. 453-b, Supp. App. 129 .

Dr. Herman F. Kraybill of the National Cancer Institute reviewing both the Maltoni and Bio-Test data stated that the laboratory experiments" fullfill the requirement for a proven carcincgen in that observations were made on angiosarcomas of the liver in several species and strains and there follows a good dose-response relationship, with most recent data showing a response at as low as 50 parts per million. Tr. 27, Supp. App. 10 . See also Tr. 97, Supp. App. 57 .

And Dr. Marvin Schneiderman of the National Cancer Institute (Tr. 72, Supp. App. 33): 17/

> [I]f I fit these data with the dose response curve, and I fit them with any of the acceptable dose response curves, there are levels below 50 which this dose response curve says to me will produce these tumors.
>
> The world does not come to an end; 50 is not a cliff. If I have a dose response curve that is going like this, I don't fall off the cliff at 50. It will continue.

In pressing for a more relaxed standard, a standard which would have gradually lowered the permissible level of exposure to vinyl chloride in PVC plants from a 50 ppm ceiling and 25 ppm average in October 1974 to a 25

17/ There was also evidence of other toxic effects from worker exposure to vinyl chloride. Dr. Key reported NIOSH's finding that "disabling liver fibrosis * * * independent of angiosarcoma, has been noted in workers from the United States plants and has been observed in almost a third of the men working in one of the German plants." Tr. 98, Supp. App. 58 .

Dr. Irving Selikoff of the Mount Sinai School of Medicine in New York reported that a Mount Sinai study of 354 vinyl chloride workers at Goodyear's Niagra Falls plant revealed that 85 or 24% had numbness or tingling of the fingers; 63 or 18% were excessively sensitive to cold; 94 or 26.6% had delayed arterial circulation; 15%, especially those exposed to vinyl chloride for longer periods, had slightly or moderately enlarged livers; and among older individuals, or with exposures more than 20 years, prevalence of abnormal airway obstruction findings was similar in smokers and nonsmokers, suggesting that the occupational environment was the cause. Tr. 221-225, Supp. App. 75-79. "In summary," stated Selikoff, "clinical examinations of 354 workers exposed to vinyl chloride in a polymerization plant demonstrated a significant prevalence of liver abnormalities, peripheral vascular changes, and lung abnormalities." Tr. 225-226, Supp. App. 79-80.

ppm ceiling and 10 ppm average by October 1975 and somewhat lower levels for VCM plants, [18] Tr. 358-361, Supp. App. 120-123 , the industry sought to draw comfort from various bio-statistical studies of its workforce.

But there was no comfort. The fact that 2 of the 15 confirmed cases of angiosarcoma of the liver struck those who had been employed in the fabrication segment of the industry where vinyl chloride levels have been far lower than those existing in PVC or VCM plants, makes imprudent the grasping for a higher than 1 ppm threshold limit value. Tr. 114-115, Supp. App. 60-61.

Similarly, the various bio-statistical studies were all flawed. Because of diagnostic difficulties, Dr. Paul Kotin, a consultant for Air Products who screened their current employees, was unable to state positively that Air Products' workers were not in fact developing angiosarcoma of the liver. Tr. 805-806, 827-828, Supp. App. 205-206, 209-210 . [19] Dr. McBurney of Diamond Shamrock, had the same doubts. Tr. 1047, Supp. App. 267 .

---

[18] For VCM plants, SPI recommended by October, 1974, a 25 ppm ceiling and 10 ppm average; by October, 1975, a 10 ppm ceiling and 5 ppm average. Tr. 358-361, Supp. App. 120-123.

[19] Dr. Kotin stated "that you can have a cancer sitting in the liver for a long, long time before any of your tests will manifest its presence" and that "if it were seated in the right lobe of the liver, right in the central portion, far removed from any of the things I have described, it could get the size of a golf ball, maybe even a baseball, before liver tests might conceivably identify it. Tr. 828, Supp. App. 210 .

Aside from diagnostic difficulties the studies which had been conducted in the rush to assemble some epidemiological data had the common limitation which derives from haste and from cancer's long latency period. Thus, for example, the Tabershaw-Cooper epidemiological study, commissioned by the Manufacturing Chemists Association examined 8,384 men who were occupationally exposed to vinyl chloride for at least one year, compared their mortality rate against a comparable population of American males, and found no statistically significant increase in any cause of death. App. 2651. However, the study simply missed a number of the angiosarcoma of the liver deaths. App. 2660. Moreover, not only did the study include workers with 1 year of exposure, [20/] it excluded 1,500 long term PVC and VCM employees. Firestone's President said of the study (Tr. 1780, Supp. App. 388):

> The statistical data is there, and I suppose everybody may interpret it in their own light, but I am sure that you are aware that there were some 1,500 VC-PVC employees long-term missing from the Tabershaw-Cooper study, including the Firestone study which is in here now. It was not part of it.
>
> And if the induction or latency period is 20 years, I must question it myself. There is 1,500 20-year plus that aren't in that study.

[20/] Only 10% of those studied had 20 or more years of exposure to vinyl chloride. Tr. 118, Supp. App. 64 .

Despite these deficiencies which inevitably reduced the number of observed tumors, Tabershaw-Cooper reported finding a higher-than-expected rate of cancers other than in the liver, and reported that theirs was "the first epidemiological study which suggests that in humans vinyl chloride may also be associated with cancer of multiple sites." App. 2651. Specifically, Tabershaw-Cooper reported that (App. 2651):

> cancers of the digestive system (primarily angiosarcoma), respiratory system, brain, and cancers of unknown site, as well as lymphomas, occurred more often than expected in those members of the study population with the greatest estimated exposure.

A similar failing was apparent in a Dow Chemical study of 335 employees monitored over a period of seven years. Dow's scientists admitted that the survey did not include many workers who either had been continuously exposed to vinyl chloride for over 20 years or who had been exposed for lesser durations over 20 years ago. The study excluded those workers who began employment with Dow as early as 1942 but who retired before 1967, the year that Dow began keeping the medical records which formed the foundation of its study. Tr. 1004-1005, Supp. App. 248-249 .

Industry also relied upon a study performed by Dr. Carl Dernehl of Union Carbide which reported that no

angiosarcomas had been found among 1,402 Union Carbide employees who had been subjected to long term vinyl chloride exposure. App. 657-665, 2441-2448. However, Dr. Dernehl admitted that his "was a crash survey performed along the last few weeks just before [the rule-making hearing]" and that the study did not include any vinyl chloride exposed workers who had died, thus automatically excluding any employee who might have died from the very diseases the study was designed to discover. Tr. 528-531, Supp. App. 142-145 .

After reviewing the record evidence, Dr. David Wegman of the Harvard School of Public Health, concluded (App. 3747):

> In summary the animal studies make clear that any human exposure level must be less than 50 ppm. How much less than this appears indicated by the human studies on malignancy, non-malignant disease and mutagenesis. There is no single material currently in use which has been shown to affect as many different parts of the body with such devastating impact as vinyl chloride. Were it possible to eliminate it from the market, this would be by far the wisest choice. If it must be used, human exposure must be kept to the absolute minimum. Exposure to more than 1 ppm is not medically defensible.

Dr. Frank Standaert's review of the record led him towards the same end (App. 3729-3730):

> The record contains * * * innumerable remarks to the effect that a man is not a mouse and that his susceptibility should not be equated with that of a mouse. The implication is that OSHA's standard should not be further reduced without direct evidence on the susceptibility of man. This kind of logic points to a path which is dangerous to follow. As noted above, it is as clear as it is possible for it to be that a similar set of toxic effects occurs in man and experimental animals. It is also clear that among the experimental animals there is no great difference in the concentrations of the gas that produce effects in the various susceptible species. Under these circumstances, there is only one prudent course to follow: assume that man is at least as sensitive as the most sensitive mamalian species. This assumption is universally applied in assessing the toxic hazard of materials to man. The potential for disaster in any other course is apparent.

5. The Requirement of Respiratory Protection.

The final vinyl chloride standard provides that where practicable and feasible engineering and work practices fail to reduce worker exposure to the 1 ppm permissible exposure level, then industry must offer its workers respiratory protection, an offer which for one year the workers may decline if exposure levels are below a 25 ppm ceiling. See supra, pp. 18-20. Much of the hearing testimony dwelt upon the implications of large scale respirator use in the vinyl chloride industry, for it was industry's position that the standard as proposed would require the full-time utilization of respirators. Tr. 356, Supp. App. 119 .

(a) Types of Respirators.

Basically, there are three general types of respirators: First, a self contained breathing apparatus, where the wearer is independent of the outside atmosphere because he is breathing through a system which admits no outside air. This type of respirator is somewhat akin to a scuba diver's back pack, and is heavy and bulky. Its use requires a highly trained individual. App. 3662, 3678, Tr. 87-90, 92/26, 310-311, Supp. App. 36-39, 53, 99-100 . Second a supplied air respirator which delivers air from an outside source for long periods of time through a supply hose connected to the wearer's facepiece. App. 3662, 3674-3675, 3679-3680, Tr. 308-310. Supp. App. 97-99 . These air-supplied respirators operate in a variety of modes -- constant flow types provide a continuous air supply and are normally used where there is an ample air supply as from an air compressor, App. 3674; demand flow types with half masks or full facepiece which deliver air flow only during inhalation, App. 3675; and pressure demand flow types which provide air flow during both inhalation and exhalation, and are used where leakage caused by negative pressure during inhalation is unacceptable due to the concentration levels surrounding the wearer. App. 3675. Any of these types can be utilized with or without a blower, the blower's advantage being that the wearer of the mask need not

force air into the mask by his own breathing. See generally, App. 3675, Tr. 92/3-92/5, 92/10-92/11, 92/25, 308-310, 318, 321-324, 327-328, Supp. App. 43-45, 48-49, 52, 97-99, 106, 109-112, 113-114. Third, are the air purifying devices which remove contaminants from the atmosphere such as gas masks, cartridges, and canisters which purify inhaled air by removing specific gases or vapors. App. 3672-3673, Tr. 83-84, 306-308, Supp. App. 34-35, 95-97.

(b) Permissible Respirators.

The permissible respirators under the final vinyl chloride standard are set forth, supra p. 18-19. 21/

21/ Under the emergency temporary standard air supplied continuous flow, air supplied pressure demand, and self contained respirators were permissible. App. 18. Under the proposed standard, the permissible types were (App. 23):

> (i) A positive pressure full facepiece self-contained breathing apparatus;
>
> (ii) A pressure-demand full facepiece self-contained breathing apparatus operating in the pressure-demand mode;
>
> (iii) A combination type "C" pressure-demand full facepiece respirator operating in the pressure-demand mode and a pressure-demand self-contained breathing apparatus operating in the pressure-demand mode; or
>
> (iv) A combination type "C" continuous flow respirator and a pressure-demand self contained breathing apparatus operating in the pressure-demand mode.

Basically, and as Dr. Hyatt recommended the final vinyl chloride standard allows the use of an air supplied continuous flow respirator, with full or half facepiece, helmet or hood for any vinyl chloride concentrations not exceeding 1,000 ppm. Tr. 92/3, Supp. App. 43 . 22/ The final standard also permits, again as Dr. Hyatt recommended, a self-contained breathing apparatus at even higher concentrations. Various canister and cartridge respirators are permitted at concentrations below 25 ppm, should they be found acceptable by NIOSH. See supra, p. 19 .

22/ Proceeding on the assumption that the permissible exposure level under the final standard would be set at 1 ppm (Tr. 87, Supp. App. 36), Dr. Hyatt's recommendations were as follows:

(1) For protection up to 100 ppm, the supplied-air respirator, demand type, with full facepiece. Tr. 92/2, Supp. App. 42.

In a demand type respirator, air is supplied only when the wearer inhales. This is also known as a negative pressure device. It is to be distinguished from the continuous flow or pressure demand types where air is supplied either all the time or both when the wearer inhales and exhales. Hyatt recommended that when demand or negative pressure devices are used and there are accordingly short periods when fresh air is not being supplied, only full mask facepieces should be permitted. This is so, he explained, because the half-mask facepiece is somewhat less efficient than the full-mask facepiece at keeping ambient air from reaching the wearer's face. Tr. 92-92/3, Supp. App. 40-43. However, where continuous flow or positive pressure is used, half masks protect as well as full masks. Tr. 92/11-92/12, Supp. App. 49-50 .

(Footnote continued)

(c) The Evidence on Respirators.

(i) Availability.

The suitability of various respirators for use at different concentrations of vinyl chloride was discussed by OSHA consultant and respirator expert Edwin C. Hyatt of the Los Alamos Scientific Laboratory, Los Alamos, New Mexico. His recommendations, which were closely followed in promulgating the final vinyl chloride standard, have been set forth supra, n. 22 .

It was Dr. Hyatt's view that the self-contained breathing apparatus is not well suited for routine work and is best reserved for emergency situations, because

---

22/ (Cont'd.)

(2) For protection up to 1,000 ppm, the supplied-air respirator, continuous flow, with half-mask facepiece, full-mask facepiece, helmet or hood. Tr. 92/3, 92/25, Supp. App. 43, 52 . This device was also permitted under the emergency temporary standard.

(3) For protection at greater than 1,000 ppm or in unknown concentrations, either the supplied-air respirator, pressure demand type, with full-mask facepiece and auxiliary self-contained supply, or, the open-circuit, self-contained breathing apparatus, pressure-demand, type with full facepiece. Tr. 92/3, 92/25, Supp. App. 43, 52.

An auxiliary self-contained air supply is an air tank with a ten-minute air supply. It is used to provide protection for short periods of time as when an employee must disconnect from the main air-supply hose to move to another location. It should be noted that Hyatt did not think that auxiliary supplies were necessary at concentrations below 1,000 ppm.

the device requires an air cylinder change after only 30 minutes of use, weighs 25-35 pounds and thus causes employee fatigue, and requires extensive employee training and equipment maintenance. Tr. 87-90, Supp. App. 36-39.[23] Hyatt also declined to recommend use of air-purifying respirators since at the time of the hearing, it was uncertain whether the air-purifying or sorbent element in these devices had an adequate service lifetime. Tr. 92, Supp. App. 40 .[24]

The Snell study reported that the VCM and PVC manufacturers and their employees preferred half-mask air-supplied respirators or cannister or cartridge type air purifying devices to any others. App. 3566. The air-supplied devices are much lighter than a self-contained apparatus, and half-mask types are more comfortable to wear than full mask facepieces. Id. Snell also indicated, as did Hyatt, that while the cartridge or canister types are the lightest and least expensive of the respirators, their effective service life against particular concentrations of vinyl chloride has not yet been established, nor have devices yet been developed which would warn the

---

23/ This device often resembles a scuba diver's gear in that it includes cylinders of air which the employee carries on his back. It is used often by fire departments. Contrary to the suggestion contained in Firestone's brief (p. 78, n. 57), Hyatt did not say that all respirators were "impractical for routine work", only that the self-contained breathing apparatus should not be routinely used.

24/ With regard to air-purifying devices, see infra, pp. 64-65.

employee when the air purifying element or sorbent is no longer effective. Id.

With regard to respirator cost and availability, Snell reported the following after surveying respirator manufacturers. App. 3679-3681:

Respirator Device/ Manufacturer Catalog No.	Cost Per Unit	Availability (Weeks to receive after order)
Supplied air devices		
(1) Air Line Respirators 25/		
- Constant Flow		
MSA #457162	$82.30	Stock Item
MSA #457161	82.30	Stock Item
Scott #4622-10 (lots of 18 and up)	60.94	2 weeks
- Demand Types		
MSA #457157	95.90	Stock Item
MSA #457165	95.90	Stock Item
Scott #4637-1 (lots of 18 and up)	75.43	3 weeks
Self-contained breathing apparatus 26/		
(1) Pressure demand, full-face-peice MSA #95069	515.00	2 weeks

25/ These types were all permitted under the emergency temporary standard. Snell also reported that all accessories for air-supplied systems were stock items with the exception of one "Clear air" blower which would take 16-18 weeks to deliver, and one 4-man snap-type manifold which would take 30 days to deliver. App. 3680.

26/ These devices were also permitted under the emergency temporary standard.

Respirator Device/ Manufacturer Catalog No.	Cost Per Unit	Availability (Weeks to receive after order)
(2) Combination pressure demand full facepiece and pressure demand self-contained breathing apparatus MSA #96395	699.00	2 weeks
(3) Positive pressure full facepiece	Not available	
(4) Combination continuous flow with pressure demand self-contained breathing apparatus	Not available	

Snell also reported that both mechanical filter and chemical cartridge respirators with accompanying accessories were all "stock items." App. 3678.

Similarly Hyatt stated that supplied-air respirators of either the continuous flow or demand type "are used by the tens of thousands." Tr. 92/25, Supp. App. 52 . He also noted that there are respirators to fit the typical size face and that employers could obtain the necessary different sized facemasks by purchasing respirators from several different manufacturers since each makes a different size mask (Tr. 92/7-92/8, Supp. App. 46-47). Moreover, Hyatt also reported that large compressors necessary for air-supplied devices are available. Tr. 92/13, Supp. App. 51 .

(ii) The Drawbacks.

At the hearing, industry spokesmen voiced numerous objections to the use of respiratory devices. Representative of this position was Dr. Joseph Tomashefski, Head of the Pulmonary Disease Department, Cleveland Clinic, who testified on behalf of SPI. Dr. Tomashefski identified several problems associated with respirator use in general: (1) unless the mask fits properly, an employee wearing the device for long periods may find it uncomfortable; (2) perspiration is not always evaporated, causing local irritation or toxic substance absorption and sometimes unpleasant odor; (3) many people find the confinement and sense of isolation distressing; others are uneasy about working in an environment that requires use of these devices; (4) sometimes, the employee may rebreathe exhaled carbon dioxide; (5) the eyepiece can become fogged or distort vision; (6) speech can be difficult because jaw movement may jar the mask and allow leaks, which may necessitate fitting the mask with special diaphragms, microphones, amplifiers or radios to provide ease of communication; (7) those with bronchitis, emphysema, and chronic asthma should not wear respirators, and (8) respirator training and maintenance programs must be developed. Tr. 311-315, Supp. App. 100-104.

With regard to particular types of respirators, Dr. Tomashefski pointed out that where blowers are used in connection with air-supplied devices, an individual attending the blower must be present as a standby. He

also stated that supplied-air respirator produce increased resistance to breathing and frequently have a long hose attached which in itself may be a nuisance or a safety hazard. Tr. 308-309, Supp. App. 97-98. Dr. Tomashefski agreed, however, that breathing resistance is very low if blower-type air-supplied devices or air-supplied hoods are used. Tr. 327-328, Supp. App. 113-114 . He also stated that air-supplied respirators "are good for hazardous environments not immediately dangerous to life * * * [and] [t]hey can be used continuously" if the supplied-air is free of carbon dioxide. Tr. 309-310, Supp. App. 98-99 . The self-contained breathing apparatus, Dr. Tomashefski said, is "heavy, bulky, requires highly trained individuals for its use * * * [and requires] warning devices indicating that the pressure supply is getting low". Tr. 311, Supp. App. 100 . Also, the air purifying devices, Dr. Tomashefski concluded, produce high resistance to breathing and sometimes leak around the mask unless adequate protection is provided. Tr. 307, Supp. App. 96 .

(iii) <u>The Need for Respirators</u>.

Notwithstanding these difficulties, Dr. Tomashefki agreed that "it's feasible" to design respirator protective devices that a normal worker could wear 4-8 hours per day. Tr. 319-320, Supp. App. 107-108. Hyatt had noted that air supplied respirators were worn for long periods of time by workers engaged in cutting or grinding

lead. Tr. 92/10, Supp. App. 48 . When asked if he disagreed with Dr. Hyatt's recommendations, Dr. Tomashefski replied (Tr. 317-318, Supp. App. 105-106):

> Not really, I think we are in line. We're both showing some of the limitations to the use of respirators. We both feel that if there is some other means by which [protection] can be accomplished, that it is preferable. If, however, it cannot be accomplished, then a respirator can be used.

Responding to another question as to whether there is a substitute for respirators, Dr. Tomashefski stated "Only good hygiene principles and removal of the contaminant." Tr. 324, Supp. App. 112 . Absent these controls or other means of preventing worker injury, Dr. Tomashefski would not only permit employees to wear respirators, "I would require that they wear them." Tr. 324, Supp. App. 112. 27/

(iv) The Current Use of Respirators.

Despite the many difficulties associated with respirators, and industry's professed opposition to large scale respirator use, there is in fact extensive respirator use both within and without the vinyl chloride industry.

Hyatt had noted that air supplied respirators are used by the tens of thousands in the United States at large. Tr. 92/25, Supp. App. 52 . He had remarked on their use for extended periods of time by workers

---

27/ Dr. Robert Soule, an industry environmental health consultant, stated that his views were in all essential respects consistent with those of Messrs. Hyatt and Tomashefski. Tr. 569-570, 621, Supp. App. 146-147 .

engaged in cutting or grinding lead. Tr. 92/10, Supp. App. 48 . Others remarked on the fact that air supplied respirators are used in the automobile industry during spraying, and in sandblasting operations, continuously, for either a half day or full day. Tr. 620-621, Supp. App. 151-152 . And Dr. Tomashefski mentioned his work with the Air Force when he himself wore respirators for periods ranging from six to eight hours a day without ill effect. Tr. 321-322, Supp. App. 109-110.

The vinyl chloride industry has already instituted the extensive use of respirators. Air Products and Chemicals, Inc., has instituted the use of air line respirators for workers engaged in reactor cleaning and maintenance, and favored air-supplied respirators whenever a 50 ppm ceiling was reached. Tr. 796-797, 804, 838, Supp. App. 202-203, 204, 213 . Uniroyal has offered its employees respiratory equipment. Tr. 1511-1513, Supp. App. 350-352 . Tenneco supplied its workers with respirators in areas where vinyl chloride concentrations exceed 25-30 ppm, and has installed a manifold air-supplied system to completely cover all of the reactor building areas at all levels, as well as other necessary plant areas. The company employs air-supplied respirators for workers engaged in loading and unloading operations, reactor operators, vessel cleaners, and

maintenance personnel. Tenneco has also issued each worker a full-face air supplied respirator for use when necessary. Tr. 699, 708-709, 717-718, 729, Supp. App.167, 183-184, 187-188, 189 . Diamond Shamrock stated that in one of its plants it has placed 25 percent of its workers in respirators for more than one hour per day. Tr. 1075, Supp. App. 276 . Firestone, in detailing the action it must take to reach the 50 ppm ceiling which it has already reached, noted that it would supply a full face mask respirator for reactor operators, stripper operators, relief operators, area fitters, utility and service personnel, lab sample men and foremen. App. 1814. Firestone has also posted eight separate areas of its Pottstown plant for air-supplied respirators, and noted that as a general matter its PVC workers require a range of movement of between 35 to 50 feet, which is well within the acceptable range of an air supplied respirator. App. 1788, Tr. 1737, Supp. App. 380 . Goodrich workers now use respirators when cleaning reactors, for unloading operations, and in its cold room. Tr. 377, 581-582, 624, 1118-1119, Supp. App. 124, 149-150, 153, 284-285. For areas where vinyl chloride concentrations might exceed 25 ppm Goodrich favors the use of air-line respirators, and has had no accidents with their use. Tr. 1139, 1163-1164, Supp. App.294, 295-296 . Indeed, the industry proposal for a much more relaxed

permissible level of vinyl chloride in the ambient air of the workplace itself would have necessitated large scale respirator use with more than 50% of PVC workers requiring at least some respirator use. App. 3692-3697. Respirators are concedely feasible for the more spacious operations associated with VCM facilities, and Dow currently employs them without incident whenever a 25 ppm concentration is exceeded. Tr. 388, 890-893, 924-925, Supp. App. 125, 218-219, 226-227 . As to the fabrication segment of the industry, since they no doubt will rather easily meet the 1 ppm level, respiratory use will be needed only occasionally, if at all. Nevertheless, should respirators be necessary, it is interesting to note that at least one compounder thought his company could live with the continual use of respirators by all of his employees. Tr. 1870, Supp. App. 392 . That full time respirator use is feasible was also the view of Howard H. Fawcett, Chairman of the Committee on Chemical Safety of the American Chemical Society, who had had extensive experience with personal protective equipment. Tr. 1363-1365, Supp. App. 315-317 .

Worker acceptance will be forthcoming. Sanford Beck, President of Local 3-727, Oil Chemical and Atomic Workers, whose members work at Goodyear's Niagra Falls plant testified (Tr. 1432-1433, Supp. App. 335-336): 28/

28/ See also the testimony of Local 891, OCAW President Vernon Jensen, a Union Carbide worker (Tr. 1431-1432, Supp. App. 334-335):

(Footnote continued)

Every man will have one, and every man tells me he will wear it.

In the PVC plant they are wearing them now. It is not a strict order that they wear them, but they do have them in their possession, and I understand they do wear them at times when it is most difficult, but they do wear them.

Lastly, there is a good expectation that cartridge or canister respirators, those most favored, will soon be adequate to protect against low concentrations of vinyl chloride. App. 4227-4239. The tests thus far have shown that commercially available carbon filter canisters, such as the Welsh 7800-IM Canister, provides 8.7 hours of protection at vinyl chloride concentrations of 25 ppm. At the end of that time, the canister allows a 1 ppm breakthrough of vinyl chloride. App. 4233. NIOSH has not yet approved any of these canister masks, but at least one is currently undergoing expedited testing at NIOSH's Morgantown, West Virginia, laboratory.

28/ (Cont'd.)

MR. KUCHENBECKER: Would you be willing to wear respirators for a period up to several years in order for the industry to get down to the level OSHA sets?

MR. JENSEN: I think the people out of necessity, do so, with reluctance, and probably some necessary procedures built in to provide for relief.

6. The Non-Existent Economic Issue.

There is a strong and growing demand for the industry's product which has allowed the VC and PVC segments of the industry to pass on price increases to their fabricators while steadily increasing sales. Thus, the industry forecast is that its 5.4 billion pound PVC production will rise to approximately 8 billion pounds in 1980. App. 3486-3487, 3492, 3499-3500; Tr. 1082-1085, 1495, Supp. App. 277-280, 349 . Between 1963 and 1973 alone, output increased 318 percent. App. 3486. While prices for PVC approximately doubled between 1972 and 1974, output remained steady. The slight leveling off from the rapid growth of earlier years was attributed to a lack of plant capacity and feedstock shortages, not the doubling in price. 29/ App. 3486, 3491-3492. PVC manufacturers currently have underway and planned, new and larger plants to meet the growing demand for their product. App. 3473-3476, 3612; Tr. 296-297, 687-689, 696-703, 744, 1082-1085, 1182, 1824-1825, Supp. App. 93-94, 172-174, 175-182, 191, 277-280, 298, 390-391.

29/ A general purpose PVC resin sells for approximately 22 cents to 25 cents per pound. App. 3492, Tr. 296-297, 745, Supp. App.93-94, 192 . VC monomer costs a little over 6 cents per pound to manufacture and sells to the PVC producer for 1-1/4 cents more. App. 3515.

Perhaps because of this healthy economic outlook, the issue of economic feasibility was not raised by the industry. Indeed, it was specifically waived. Thus, in the colloquy quoted earlier between counsel for the industry trade association, and Mr. Vittone speaking both for Goodrich and for all segments of the industry at large, 30/ Mr. Vittone specifically stated that the industry was not raising any economic objection to the proposed standard. The only caveat, and it is one without any evidentiary support, is that economic feasibility would be raised if the standard "would put the industry out of business." Tr. 1186-1187, Supp. App. 299-300 . Dr. Johnson of Goodrich similarly testified that "we have not raised the economic feasibility question in this hearing, and it is simply an irrelevant question. " Tr. 1175, Supp. App. 297 .

The extent of its irrelevancy can be gauged by the study which the industry commissioned Arthur D. Little to carry out. That consultant was asked to assess the economic impact on the country at large <u>assuming an immediate and complete shutdown of all PVC plants</u>. Tr. 465, 474-476, 486, 496, Supp. App. 131, 132-134, 137, 138 . Arthur D. Little was <u>not</u> asked to study whether or not the proposed standard would in fact close anyone down.

30/ The SPI has 1,400 members <u>including producers, compounders and fabricators</u>, and represents 95% of the plastics materials and machinery produced in the United States. Tr. 330, Supp. App. 115 .

Tr. 465, 484-485, Supp. App. 131, 135-136:

> MR. KLEIN: So, then, I assume that you have no idea as to whether or not industry would be shut down by the proposed standards?
>
> MR. FICCAGLIA: Not at all, sir.
>
> * * * * *
>
> MR. FRIEDMAN: Did you make any evaluation of the plants that have to be shut down, assuming the implementation of the standard proposed by the government?
>
> MR. JENEST: The PVC resin plants?
>
> MR. FRIEDMAN: Yes.
>
> MR. JENEST: None whatsoever. That was not part of our task.
>
> * * * * *
>
> MR. FRIEDMAN: You made no evaluation, then, of the industry's ability to meet any prospective increased cost that might result from implementation of the proposed standard?
>
> MR. JENEST: None whatsoever.

There simply is no evidentiary basis for industry to claim economic harm from the final vinyl chloride standard. The VCM and PVC companies gave their commitments to do all within their power to protect their workers without consideration of cost. See supra, pp.28-32; also Tr. 747, 1186, Supp. App.193, 299.

To the extent that there was any muted economic cost objection, it was bandied about by Firestone. But even Firestone, whose cost estimates were considered consistently high by Snell, still stated that its operations

would remain profitable even if it were to spend $50 million to meet whatever standard the Secretary of Labor might impose. App. 1884, 1891, 3553. And even assuming an investment of that magnitude Firestone calculated that the price of PVC resin would rise 55 percent, a price rise far less than the industry has withstood with growing sales over the past two years. See p.73, supra; App. 1774.

ARGUMENT

I

THE VINYL CHLORIDE STANDARD, WITH GOOD REASON AND WITH A FIRM BASIS IN THE EVIDENCE, REQUIRES THE INDUSTRY TO USE ALL FEASIBLE ENGINEERING AND WORK PRACTICES TO REACH A 1 PPM PERMISSIBLE EXPOSURE LEVEL, WHILE IN THE INTERIM PROVIDING RESPIRATORY PROTECTION.

A. The Occupational Safety and Health Act Permits the Secretary of Labor to Impose a Standard which Forces Industry to Technological Innovation.

Congress enacted the Occupational Safety and Health Act of 1970, 29 U.S.C. 651, et seq., so that if possible, a worker would not be physically scarred from his life's work. Industrial Union Department, AFL-CIO v. Hodgson, 499 F. 2d 467 (C.A.D.C. 1974); National Realty & Construction Co., Inc. v. OSHRC, 489 F. 2d 1257 (C.A.D.C. 1973). The Act, as this Court has noted, "has been called the most revolutionary piece of labor legislation since the National Labor Relations Act." REA Express,

Inc. v. Brennan, 495 F. 2d 822, 825 (C.A. 2, 1974); Brennan v. OSHRC and Gerosa, Inc., 491 F. 2d 1340, 1343 (C.A. 2, 1974). Its purpose is remedial and preventative -- to forestall worker injury and "to set new standards of industrial safety." REA Express, Inc. v. Brennan, supra, at 825.

Congress was particularly concerned with the occupational harzards emanating from new or difficult to detect substances which presented health problems of ever-increasing complexity. Industrial Union Department, AFL-CIO v. Hodgson, supra at 471; American Smelting & Refining Co. v. OSHRC, 501 F. 2d 504, 510-511 (C.A. 8, 1974). Foremost among these concerns was the carcinogenic threat posed by "new chemicals and formulations about which little is known." Legislative History of the Occupational Safety and Health Act of 1970, 92nd Cong., 1st Sess. p. 849 (June, 1971) (Legislative History); see also Legislative History at pp. 142-143, 159-160, 502-503, 510, 845-846; Industrial Union Department, AFL-CIO v. Hodgson, supra. As Senator Yarborough put it (Legislative History at 510):

> We are talking about assuring the men and women who work in our plants and factories that they will go home after a day's work with their bodies intact. We are talking about assuring our American workers who work with deadly chemicals that when they have accumulated a few years seniority they will

> not have accumulated lung congestion and poison in their bodies, or something that will strike them down before they reach retirement age.

That assurance was to be provided by imposing a general duty upon employers to provide an atmosphere free from recognized hazards, and by authorizing the Secretary of Labor to promulgate occupational safety and health standards effectuating the statutory purpose "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions". 29 U.S.C. 651, 29 U.S.C. 654(a)(1), (2); 29 U.S.C. 655(b). As this Court has summarized the Act's obligations, Brennan v. OSHRC and Gerosa, Inc., supra, 491 F. 2d at p. 1343:

> Each year prior to the passage of the Act, 14,000 workers died and 2.2 million were disabled by accidents in the workplace. Congress hoped to achieve its objective of preventing accidents by encouraging employers "to institute new and to perfect existing programs for providing safe and healthful working conditions." 29 U.S.C. § 651(b)(1). The Act contains a section imposing upon employers a general duty to provide a safe work environment. 29 U.S.C. § 654(a)(1). However, Congress apparently placed primary reliance upon promulgation by the Secretary of specific regulations, such as the one in this case, which the statute commands employers to obey. 29 U.S.C. 654(a)(2); S. Rep. No. 91-1282, supra, 1970 U.S. Code Cong. & Admin. News at 5185-5186. Thus, it is especially important that these regulations be construed to effectuate congressional objectives.

That those regulations or standards could and should force industry to technological innovation is clear. It is clear in the statutory purpose to assure so far as possible a healthful working environment; 29 U.S.C. 651(b); it is clear in the congressional statement of purpose "to stimulate employers * * * to institute new * * * programs for providing safe and healthful working conditions," 29 U.S.C. 651(b)(1); it is clear in the congressional purpose and policy to foster research and to develop "innovative methods, techniques, and approaches for dealing with occupational safety and health problems," 29 U.S.C. 651(b)(5); and it is clear in the very specific obligation which the Act places upon the Secretary, 29 U.S.C. 655(b)(5): 31/

31/ The specific legislative history of 29 U.S.C. 655(b)(5) under which the Secretary of Labor acted in promulgating the vinyl chloride standard evidences Congress' consistent intent that the burden has been placed on industry to use its minds, its money, and its ingenuity, to create an environment which will not materially impair its employees' health.

Senator Dominick was concerned that Section 6(b)(5) of the Senate reported bill, S. 2193, obligated industry to be an insurer of its employees' absolute safety. It specified that the Secretary's standards should assure "that no employee will suffer any impairment of health" at the workplace. (Emphasis added.) Legislative History at pp. 242, 367. It was Senator Dominick's view that, "No job can be rendered perfectly safe, and no employee can be made perfectly secure from injury." Id. at 480. In offering a compromise amendment which was accepted and enacted as 29 U.S.C. 655(b)(5), Senators Dominick and Williams clearly understood that the Secretary of Labor was to force industry to use its best efforts to prevent any material impairment of a worker's health. Legis. History, at p. 503:

(Footnote continued)

The Secretary, in promulgating standards dealing with toxic materials or physical agents under this subsection, shall set the standard which most adequately

---

31/ (Cont'd.)

MR. WILLIAMS: * * * As I understand this amendment, it will provide a continued direction to the Secretary that he shall be required to set the standard which most adequately and to the greatest extent feasible assures, on the basis of the best available evidence, that no employee will suffer any material impairment of health of [sic] functional capacity even if such employee has continual exposure to the hazard dealt with for the period of his working life. (Emphasis added.)

Certainly that is the objective, and included within this concept of unimpaired health and functional capacity is protection against diminished life expectancy.

* * * * *

MR. DOMINICK. * * * It is my understanding, if I may say so, that what we are doing now is to say that the Secretary has got to use his best efforts to promulgate the best avail.ble standards, and in so doing, that he should take into account that anyone working in toxic agents or physical agents which might be harmful may be subjected to such conditions for the rest of his working life, so that we can get at something which might not be toxic now, if he works in it a short time, but if he works in it the rest of his life it might be very dangerous; and we want to make sure that such things are taken into consideration in establishing standards; is that correct? (Emphasis added.)

MR. WILLIAMS of New Jersey: That is exactly correct.

Clearly cancer materially impairs health, and the Secretary is to promulgate the best available standard -- not simply one based on the best available technology -- to counter that hazard.

> assures, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity even if such employee has regular exposure to the hazard dealt with by such standard for the period of his working life. Development of standards under this subsection shall be based upon research, demonstrations, experiments, and such other information as may be appropriate. In addition to the attainment of the highest degree of health and safety protection for the employee, other considerations shall be the latest available scientific data in the field, the feasibility of the standards, and experience gained under this and other health and safety laws. Whenever practicable, the standard promulgated shall be expressed in terms of objective criteria and of the performance desired. (Emphasis added.)

Congress' technologically forcing purpose is evident as well from the general body of environmental legislation on which it drew in enacting the Occupational Safety and Health Act. The House Report is explicit (Legislative History at p. 844):

> More and more nationwide activities are focusing on the "Environmental Crisis" -- the pollution of air and water and the destruction of natural resources. Unfortunately, national attention given to environmental problems fails to give sufficient recognition to the pertinent question of occupational safety and health. Our environment is not solely the air we breathe traveling to and from work. It is also the air we breath[e] at work. The issue of health and safety of the American working man and woman is the most crucial one in the whole environmental question, because it is out of the workplace that the problem of pollution arises; and over 80 million workers spend one-third of their day in that environment.

In short, the Occupational Safety and Health Act was conceived by Congress as the environmental policy act of the workplace. And just as the National Environmental Policy Act has been termed "action forcing," Calvert Cliffs Coordinating Committee v. United States Atomic Energy Commission, 449 F. 2d 1109, 1110-1111 (C.A.D.C. 1971) so too was the Occupational Safety and Health Act and its environmental progentiors.

The Clean Air Act Amendments of 1970, enacted contemporaneously with OSHA, were held to embody a requirement forcing industry to technological innovation in reducing automotive pollutants, despite that statute's restrictive language allowing as a defense to compliance that the necessary technology was "not available". International Harvester Company v. Ruckelshaus, 478 F. 2d 615, 624-629 (C.A.D.C. 1973): "Available" technology did not mean technology in being, but rather what might become available if industry used "all good faith efforts" to meet the pollution emission requirements. Id. at 624, 628-629. So too, when Congress provided that standards of performance governing emissions of air pollutants by new stationary sources were to require the best system of emission reduction that "has been adequately demonstrated", industry's suggestion that "'adequately demonstrated' implies that any cement plant now in existence be able to meet the proposed standards", was flatly

rejected. Rather, the Court held that the statutory term looked "toward what may fairly be projected for the regulated future". Portland Cement Association v. Ruckelshaus, 486 F. 2d 375, 391 (C.A.D.C. 1973).

Other health and safety legislation has been given the same broadly remedial reading. The Automobile Safety Act of 1966 which authorized the Department of Transportation to set minimum "practicable" performance standards, was explicitly held to authorize technology forcing automobile safety standards. Chrysler Corp. v. Department of Transportation, 472 F. 2d 659, 673 (C.A. 6, 1972):

> In summary, the Agency is empowered to issue safety standards which require improvements in existing technology or which require the development of new technology, and it is not limited to issuing standards based solely on devices already fully developed. This is in accord with the Congressional mandate that 'safety shall be the overriding consideration in the issuance of standards.' S. Rep. 1301, 2 U.S. Code, Cong. & Admin. News, p. 2714 (1966).

Perhaps the best summation of Congress' consistent intent that the burden has been placed on industry to use its minds, its money, and its ingenuity, to create a safer environment is Senator Muskie's comment on the Clean Air Act Amendments of 1970, comments equally

applicable here [32/] (116 Cong. Rec. 16091 (daily ed., Sept. 21, 1970) (quoted in Natural Resources Defense Council, Inc. v. EPA, 489 F. 2d 390, 401 (C.A. 5, 1971)):

> The first responsibility of Congress is not the making of technological or economic judgments -- or even to be limited by what is or appears to be technologically or economically feasible. Our responsibility is to establish what the public interest requires to protect the health of persons. This may mean that people in industries will be asked to do what seems to be impossible at the present time, but if health is to be protected, these challenges must be met.

We submit that this much is irrefutable -- that in enacting the Occupational Safety and Health Act of 1970,

---

32/ See discussion, supra, pp.81-83. It should be noted that despite common knowledge that no technology existed for the automobile manufacturers to meet the emission reduction standards, and that it was unclear when if ever that technology would exist, Congressman Staggers explicitly stated that the obligation placed on industry was simply to do what was "feasible", 116 Cong. Rec. 42519, 91st Cong., 2d Sess. (Dec. 18, 1970):

> The conferees have been guided by two principles: to do what is feasible and to do what is reasonable.
>
> The bill passed by the other body incorporated many provisions which had not been included in the bill as passed by the House. The House conferees scrutinized carefully each of these provisions and applied to them the test of reasonableness and feasibleness. On the basis of these two tests, many of these Senate provisions have been revised. The revisions, however, do not weaken those provisions. On the contrary, the revisions strengthen them because they make more likely that we shall achieve the desirable goals which these provisions were designed to achieve.

Congress intended industry to use its best efforts to develop innovative technology which would assure to the utmost that no employee would suffer material impairment of health from the toxic chemicals he breathes at work; 33/ that industry has here, in fact, explicitly given the Secretary of Labor its commitment to do just that; supra, pp. 28-32; and that the Secretary's standard requires that it be done. We turn to the evidence.

B. The Secretary's Standard is a Reasoned and Supportable Response to the Hazard of Vinyl Chloride.

The principal obligation placed on industry by the Secretary's standard is to reduce vinyl chloride exposure to no more than 1 ppm averaged over an 8 hour period, and 5 ppm averaged over any period not exceeding 15 minutes. App. 4, 7; 29 C.F.R. 1910.93q(c). This exposure limit is to be met where possible by "[f]easible engineering and work practice controls [which] shall immediately be used to reduce exposures to at or below the permissible exposure limit." App. 7; 29 C.F.R. 1910.93q(f)(1). Whenever feasible engineering and work practice controls which can be instituted immediately are not sufficient to reduce exposures to at or below the permissible exposure limit, they must nonetheless be used to reduce exposures to the lowest practicable

33/ Industry apparently concedes this since it describes its own proposal for a vinyl chloride standard as a "goal" -- i.e., a standard beyond its current technology. See Brief for Firestone, p. 33, n. 29 and p. 67, n. 53.

level, and supplemented by respiratory protection. App. 7; 29 C.F.R. 1910.93q(f)(2).

Industry contends that these obligations are unsupported by evidence and unreasoned. They are neither. The vinyl chloride standard is a sensible and rational response to the potent carcinogenic hazard posed by worker exposure to vinyl chloride and is firmly supported by the record evidence. 34/

(i) The requirement that industry institute all feasible engineering work practices to reduce exposures to the 1 ppm level.

We need only highlight the facts which have already been extensively set forth, supra, pp. 21-76 . They are these. Thirteen workers have died of angiosarcoma of the liver from exposure to vinyl chloride. It is a potent human carcinogen which not only causes liver cancer, but very possibly causes other multi-site cancers in man as well. Workers, for years, and until this year, have been breathing vinyl chloride at concentrations in the hundreds of parts per million, far in excess of the concentration at which vinyl chloride causes multi-site tumors in animals -- 50 ppm, the lowest concentration tested.

34/ The scope of judicial review need not detain us here. That question has been the subject of opinions by this Court and a number of other courts of appeals as well. See Associated Industries of New York State, Inc. v. U.S. Dept. of Labor, 487 F. 2d 342 (2d Cir. 1973); Industrial Union Dept., AFL-CIO v. Hodgson, 499 F. 2d 467 (C.A.D.C. 1974); Synthetic Organic Chemical Manufacturers Ass'n. v. Brennan, F. 2d (C.A. 3, No. 74-1129, August 26, 1974); Florida Peach Growers Ass'n., Inc. v. Department of Labor, 489 F. 2d 120 (C.A. 5, 1974); National Roofing Contractors Ass'n. v. Brennan, 495 F. 2d 1294 (C.A. 7, 1974).

(Footnote continued)

A sensible safety factor for simply toxic chemicals is to limit man's exposure to 1/100 of the no-effect level in animals. Here, we are dealing with a proven human carcinogen, whose no effect level in animals has not even been established, and whose no effect level in man is unknown. The only prudent course of action is to reduce human exposure by all means feasible to the lowest measurable minimum, 1 ppm. That is what Congress intended and that is what the Secretary has obligated industry to do.

The evidence of the rightness of that decision is not merely substantial, but overwhelming. That DDT posed a potential threat of cancer in man was considered substantial evidence enough to impose an outright ban on its use. Environmental Defense Fund, Inc. v. Environmental Protection Agency, 489 F. 2d 1247, 1252-1254 (C.A.D.C. 1973). That vinyl chloride has caused cancer in man is certainly substantial evidence enough to limit workers' exposure to the absolute feasible minimum. See also, Synthetic Organic Chemical Mfrs. Ass'n v.

34/ (Cont'd.)
We take it there is basic agreement that the Secretary of Labor, in promulgating standards, may not go outside the rulemaking record; that to the extent he finds facts they must be supported by substantial evidence; and that to the extent that he exercises what is more akin to legislative judgment his judgment must be reasoned.

Whatever may be the proper formulation for this test of judicial review, we agree with Judge Friendly that denominating it as an "arbitrary and capricious" test or a "substantial evidence" test is unlikely to have dispositional significance. Associated Industries of New York State, Inc. v. U.S. Dept. of Labor, supra. And certainly it has no dispositional significance in this case.

Brennan, supra, p. 86 ; Opinion of the Administrator, Environmental Protection Agency on the Suspension of Aldrin-Dieldrin, 39 Fed. Reg. 37265-37272 (Oct. 18, 1974) (petition for review pending).

The Secretary was under no false illusions as to the effort which would be required for industry to engineer down to 1 ppm. He correctly found on the record evidence that the effort, especially for PVC manufacturers, might take years, and even then that not every worker might be assured of adequate protection without the use of a respirator. But he was also aware of the fact, again amply supported by the record, that initial industry efforts by those most vigorous had resulted in substantial reductions in vinyl chloride exposure -- indeed, for some job classifications the permissible exposure level had already been reached. That much could still be done by way of technological innovation was apparent. But Congress had mandated that it be done, and industry had given a commitment to exert its fullest technological effort. The Secretary was free to take both at their word.

It hardly does justice to the Secretary's Statement of Reasons in support of his decision, to argue as Tenneco has done, that the Secretary was acting upon the mistaken belief that the engineering feasibility of reaching the 1 ppm level was a foregone conclusion. The Secretary was not misguided, and a full reading of his decision shows that he was not. The Secretary's

"belief", on which petitioners hinge so much, was nothing more than a healthy skepticism toward laggards, and a respectful appreciation of industry's ingenuity when it exerts its best efforts. Senator Muskie shared the same view, as did Mr. Justice Frankfurter, Radio Corporation of America v. United States, 341 U.S. 412, 427 (1951) (Frankfurter, J., dubitante):

> Experience has made it axiomatic to eschew dogmatism in predicting the impossibility of important developments in science and technology. Especially when the incentive is great, invention can rapidly upset the prevailing opinions of feasibility.

The Secretary understood full well that the 1 ppm engineering goal [35/] which he had established was more ambitious than industry had sought. But Dow Chemical for one, had seriously doubted whether the choice of one goal over another would influence its efforts, and industry as a whole committed its best efforts to do all that was technologically feasible. The Secretary's 1 ppm engineering goal, is after all a goal, tempered by considerations of feasibility. Its effect is to place the burden on industry, where Congress wanted the burden to be placed, to use its best efforts and to define feasibility through those efforts. That is authorized by statute and may constitutionally be imposed. See infra, pp.95-99 . It is fully supported by the facts.

35/ The 1 ppm permissible level of exposure is a requirement. If the engineering goal of a 1 ppm level cannot feasibly be fulfilled then the 1 ppm requirement is to be met through respiratory protection.

(ii) The requirement that industry provide respiratory protection where engineering fails to reach the 1 ppm level.

The Secretary's decision to require respiratory protection where engineering does not reach the 1 ppm goal is also eminently sound and supported, for he could legitimately conclude that there is nothing else to guard against the unwarranted risk of still more deaths from vinyl chloride exposure until the 1 ppm level is attained.

To be sure, respirators have many drawbacks. Those drawbacks were detailed at the hearing and recognized by the Secretary. But absent engineering and work practice advances there is nothing else to protect workers against vinyl chloride concentrations in excess of the permissible level, and thus no other adequate protection to counter vinyl chloride's carcinogenic hazard.

In these circumstances, it was the considered opinion of even industry's witness, Dr. Tomashefski, that respirators should be required (Tr. 324, Supp. App.112):

> MR. BELICSKY: One more question. Do you think there is a substitute for respirators?
>
> DR. TOMASHEFSKI: Only good hygiene principles and removal of the contaminant.
>
> MR. BELICSKY: If situations are such that the only way an operation can feasibly be conducted without injuring an individual, would you permit workers to wear respirators?

DR. TOMASHEFSKI: I would not only permit them; I would require that they wear them. (Emphasis added.)

The Secretary similarly concluded (App. 5):

> that if the environmental level is not controlled to the permissible exposure limit, then employees must be afforded respiratory protection.

The standard effectuates that sensible conclusion.

While industry might find widespread respiratory use distasteful, the Secretary could legitimately conclude that the carcinogenic hazard of vinyl chloride must override that distaste. Other industries operate with their workers in respirators either full or half time, and indeed the vinyl chloride industry itself in response to the 50 ppm ceiling of the emergency temporary standard, has already instituted widespread respiratory protection. Those workers who testified stated that they and their colleagues would be willing, especially with time and training, to wear respirators. Industry's concern that the difficulties of respirator use will cause a wholesale rejection of respirators by their employees is not shared by the workers who testified.

Moreover, while industry has claimed that as of January 1, 1975, the Secretary's standard will require the full time use of respirators by everyone they employ, the actual effect will be much more limited. First, few among the many hundreds of thousands of workers in fabrication, processing, and compounding of vinyl chloride

will need respiratory protection. Much of that segment of the industry is already below the 1 ppm permissible level. Its inclusion in the standard is justified since there have been two confirmed deaths from angiosarcoma of the liver among fabrication workers, not all of those plants are below the 1 ppm level, and those that are reached it by improving the ventillation of their plants to disperse the vinyl chloride concentrations. As Anthony Mazzochi of the Oil, Chemical and Atomic Workers International Union, said (Tr. 1407, Supp. App. 319):

> [T]hese improvements would not have come about had fabrication plants not been included under the emergency temporary standard and the proposed permanent standard.

The universe of anticipated respiratory use, then, is quite narrow. In effect, and at most, we are dealing with a total of 6,500 workers -- 1,500 employed in VCM facilities, and 5,000 in PVC plants. And it is still narrower at the outset, for the Secretary -- again cognizant of the need for training in respirator use -- not only deferred application of the final vinyl chloride standard from October 1, 1974 to January 1, 1975, but also has made respirator use discretionary with employees until January 1, 1976, where the vinyl chloride concentration in the workplace is below a ceiling of 25 ppm. 29 C.F.R. 1910.93q(g)(1).

Industry has argued to this Court, that the Secretary's willingness to allow this period of adjustment evidences a lack of seriousness that a 1 ppm exposure limit is truly necessary for employee protection. It evidences nothing of the sort. Rather, it is sensible administration for what the Secretary recognized may be a trying period of worker adjustment. When banning the use of DDT, the Administrator of the Environmental Protection Agency, William D. Ruckelshaus, took the same approach. Rather than imposing an immediate cancellation on DDT's pesticidal use as of the date of his cancellation decision, Mr. Ruckelshaus allowed a six months lead time so that farmers could be trained, and accustom themselves to the use of other more toxic, but not potentially carcinogenic, pesticides. Environmental Defense Fund, Inc. v. Environmental Protection Agency, 489 F. 2d 1247, 1250 (C.A.D.C. 1973).

The worker universe then for required[36/] respirator use as of January 1, 1975, encompasses only those facilities which exceed the 25 ppm ceiling. The VCM facilities are already below that 25 ppm ceiling for the vast majority of their workers. See pp. 33-35, supra, especially Exhibits B-100 through B-108 of Snell Report, Supp. App. 505-528 . We are left with some 5,000 PVC workers, and even here,

---

36/ The industry must still offer respirators to all workers exposed to vinyl chloride concentrations in excess of the 1 ppm permissible exposure limit.

some workers are already below the 25 ppm ceiling, and others are now using respirators. See supra, pp. 35-44, 68-72, especially Exhibits B-2 through B-24 to Snell Report, Supp. App. 423-504.

In short, industry's claim that the Secretary's standard imposes immediate, full-time, universal, respirator use, is something of an exaggeration. Even if it were not an exaggeration, there is substantial evidence that workers can wear respirators throughout the workday, and there is substantial evidence to require respirator use. The case for respirators is simply this--they have been used, they can be used, and there is nothing else to use which will protect against vinyl chloride's hazards where engineering and work practices fail. That the Secretary's standard nevertheless imposes a continuing obligation on industry to engineer down to a 1 ppm level even though its workers are given respirators, is not doubly arbitrary as Tenneco claims, but merely follows the advice of industry's own witness that the best approach to protecting against a hazardous environment is "good hygiene principles and removal of the contaminent". Tr. 324, Supp. App. 112.

II

THE REQUIREMENT THAT INDUSTRY USE ITS BEST EFFORTS TO REACH THE LOWEST PRACTICABLE LEVEL OF VINYL CHLORIDE EXPOSURE THROUGH FEASIBLE ENGINEERING AND WORK PRACTICE CONTROLS, IS NOT UNCONSTITUTIONALLY VAGUE.

It comes as something of a surprise that industry should claim the Secretary has acted unconstitutionally in imposing as a requirement, what industry committed itself to accomplish. In essence, industry is arguing that neither men of common intelligence, nor industry itself, can understand the meaning of the commitment industry gave to do everything technologically feasible to reduce vinyl chloride concentrations to the lowest practicable level.

Of course the argument lacks merit. There is nothing unconstitutionally vague in government obligating industry to use its best efforts to accomplish what is feasible and practicable. Congress has been doing just that in the recent environmental legislation we reviewed earlier. The automobile industry is precisely in point. Under the Clean Air Act of 1970, Congress obligated industry to reduce emission pollutant by 90 percent by 1975 and provided a one year escape hatch if it could not feasibly be done. International Harvester Company v. Ruckelshaus, 478 F. 2d 615, 623 (C.A.D.C. 1973):

Congress was aware that these 1975 standards were "drastic medicine," designed to "force the state of the art." There was, naturally, concern whether the manufacturers would be able to achieve this goal. Therefore, Congress provided, in Senator Baker's phrase, a "realistic escape hatch": the manufacturers could petition the Administrator of the EPA for a one-year suspension of the 1975 requirements and Congress took the precaution of directing the National Academy of Sciences to undertake an ongoing study of the feasibility of compliance with the emission standards. The "escape hatch" provision addressed itself to the possibility that the NAS study or other evidence might indicate that the standards would be unachievable despite all good faith efforts at compliance. This provision was limited to a one-year suspension, which would defer compliance with the 90% reduction requirement until 1976. Under section 202(b)(5)(D) of the Act, 42 U.S.C. § 1857f-1(b)(5)(D), the Administrator is authorized to grant a one year suspension

> only if he determines that (i) such suspension is essential to the public interest or the public health and welfare of the United States, (ii) all good faith efforts have been made to meet the standards established by this subsection, (iii) the applicant has established that effective control technology, processes, operating methods, or other alternatives are not available or have not been available for a sufficient period of time to achieve compliance prior to the effective date of such standards, and (iv) the study and investigation of the National Academy of Sciences conducted pursuant to subsection (c) of this section and other information

> available to him has not indicated that technology, processes, or other alternatives are available to meet such standards. (Emphasis added.)

Here too, the vinyl chloride standard contains the built-in escape hatch that industry is obligated to achieve only what its best efforts prove feasible of achievement. That is a criterion constitutionally capable of enforcement. It has already been applied without constitutional difficulty by the Environmental Protection Agency. Thus, when industry sought a one year suspension of the Clean Air Act's emission reduction requirements, they were afforded a hearing to prove their case and a suspension was granted. Motor Vehicle Pollution Control Suspension Granted, 38 Fed. Reg. 10316-10330 (April 26, 1973). Administrator Ruckelshaus' decision thoroughly discusses the kind of evidence necessary to support a claim of technological infeasibility, as well as the proof which must be forthcoming to show that industry used all good faith efforts to meet the technology forcing standards. Ibid. There is nothing unconstitutionally vague about it.

The Occupational Safety and Health Act affords industry those same due process protections. Enforcement proceedings are brought upon notice, a hearing is held before the Occupational Safety and Health Review Commission, a body independent of the Secretary of Labor, the Commission's decision must be based upon the evidence of

record, and an aggrieved party is afforded judicial review. 29 U.S.C. 659-661; see generally, National Realty & Construction Co., Inc. v. OSHRC, 489 F. 2d 1257 (C.A.D.C., 1973); REA Express, Inc. v. Brennan, 495 F. 2d 822 (C.A. 2, 1974); Brennan v. OSHRC and Gerosa, Inc., 491 F. 2d 1340 (C.A. 2, 1974). Those procedures comport with due process. McLean Trucking Co. v. OSHRC, No. 73-2392, F. 2d (C.A. 4, Sept. 4, 1974) (slip op. p. 9).

Indeed, the Act's procedures are amply adequate. Not only may the industry raise the questions of feasibility and good faith efforts as a defense to an enforcement action, but the Act also provides a mechanism for an employer to obtain a variance from a standard. 37/ Even beyond this, the standard explicitly requires industry to keep the Secretary of Labor informed (at least every six months should the Secretary so request) as to industry's plans and progress to engineer down to a 1 ppm level. 29 C.F.R. 1910.93q(f)(2)-(3). This dialogue between government and industry which the standard mandates, assures that no precipitous action will be taken where industry has in fact used its best efforts. The constitutionality of the standard is beyond reproach.

37/ Section 6(d) of the Act, 29 U.S.C. 655(d), provides that an employer may obtain a variance, where after notice and hearing, he:

> has demonstrated by a preponderance of the evidence that the conditions, practices, means, methods, operations,

(Footnote continued)

See also, Natural Resources Defense Council, Inc. v. EPA, 489 F. 2d 390, 401-403 (C.A. 5, 1974); Georgia v. Tennessee Copper Co., 206 U.S. 230, 239 (1907); cf., Associated General Contractors of Massachusetts v. Atshuler, 490 F. 2d 9, 17-19 (C.A. 1, 1973), cert. denied, 94 S. Ct. 1971 (1974); Rios v. Enterprise Ass'n. Steamfitters Local 638, 501 F. 2d 622, 629 n. 5, 632 (C.A. 2, 1974); Legality of Revised Philadelphia Plan, 42 Op. Att'y. Gen. No. 37.

III

PETITIONERS' OTHER OBJECTIONS TO THE STANDARD ARE WITHOUT MERIT.

The industry raises a number of other objections to the standard which can be dealt with briefly.

A. The Standard's Warning Signs and Labels are Reasonable - 29 C.F.R. 1910.93q(1).

The Secretary's standard prescribes warning signs and labels for vinyl chloride which identify it as a cancer suspect agent. The record clearly shows that vinyl chloride is a cancer suspect agent and has caused cancer in man. There is no reason not to tell the workers that. As the Secretary stated (App. 6):

37/ (Cont'd.)
or processes used or proposed to be used by an employer will provide employment and places of employment to his employees which are as safe and healthful as those which would prevail if he complied with the standard.

> We believe that a diluted form of warning will not suffice. We appreciate the concern of employers with the reaction of their employees. But we consider it imperative that a worker be fully informed, and that he realize the possible risks involved in his occupation. Coupled with the training requirement in the standard, we believe that the signs and labels required will adequately inform employees of the hazard. In addition, such signs will warn unauthorized personnel to keep out of regulated areas.

That judgment is sound and supported by substantial evidence. Requiring "cancer-suspect" signs and labels has previously been upheld. Synthetic Organic Chemical Mfrs. Ass'n. v. Brennan, supra, 38/ (approving sub silentio the cancer warning signs for the chemical EI which petitioners had challenged. See 39 Fed. Reg. 3784-3785 (Jan. 29, 1974)).

B. The Medical Examination Provisions are Reasonable - 29 C.F.R. 1910.93q(k).

Tenneco has argued that since angiosarcoma of the liver cannot be diagnosed until its terminal stages, it is unreasonable to establish a medical surveillance program for employees. But in addition to causing liver cancer, vinyl chloride has been associated with other disabling illnesses, and existent medical tests can warn of liver abnormalities. See supra, pp. 3-4, 53. The

38/ SPI's argument that the Secretary is pre-empted by 29 U.S.C. 653(b)(1) from prescribing labels on trucks is mistaken. The Secretary is pre-empted only when a sister agency actually exercises its regulatory powers over a particular hazard. Legislative History 162, 237, 997, 1185-1186, 1204. The Department of Transportation has prescribed labels warning of vinyl chloride's flammable and explosive properties, not of its carcinogenic hazards.

Act allows for medical examinations at the Secretary's discretion, 29 U.S.C. 655(b)(7), and they have previously been upheld. Industrial Union Dept., AFL-CIO v. Hodgson, 499 F. 2d 467, 484-485 (C.A.D.C. 1974).

C. The Non-Existent Economic Issue.

Firestone has complained that the Secretary has ignored the economic impact of the standard on industry. But the Secretary's obligation is to address only the principal issues raised at the hearing, not each and every tangential or non-existent one. Greater Boston TV Corp. v. FCC, 444 F. 2d 841 (C.A.D.C. 1970), cert. denied, 403 U.S. 923 (1971); WAIT Radio v. FCC, 418 F. 2d 1153 (C.A.D.C. 1969).

Here, when the SPI spokesman, representing 95 percent of the plastics industry at large, specifically and consciously under questioning from its own counsel waived an economic impact argument, the Secretary was free not to address himself to it. And it is even more compelling where, as here, industry retained a leading economic consultant, Arthur D. Little, to testify on its behalf, and never asked its consultant to study whether the Secretary's standard would in fact close down a single plant. More so still where the only economic impact issue comes from the second leading producer of PVC resin, hardly a company which is on the periphery of economic survival.

In any event the Secretary's standard contains adequate safeguards for industry. The engineering requirement, on which the economic issue is hinged, is tempered by considerations of feasibility. The Secretary can legitimately take into account economic considerations when he examines whether industry has in fact made all feasible engineering efforts to reach the 1 ppm engineering goal. Industrial Union Department, AFL-CIO v. Hodgson, 499 F. 2d 467, 477-478 (C.A.D.C. 1974). EPA did just that when it considered whether the automobile companies had exerted all good faith efforts to meet the Clean Air Act's emission reduction standards. Motor Vehicle Pollution Control Suspension Granted, 38 Fed. Reg. 10316-10330 (April 26, 1973).

D. The Standard's Monitoring Requirements Are Reasonable - 29 C.F.R. 1910.93q(d) and (g)(6)(ii).

Tenneco has argued that it is unreasonable to subject an employer to a citation where his plant is not in compliance with the permissible exposure limit but the employer has nevertheless fulfilled the required monitoring requirements.

The argument miscontrues the employer's principal obligation under the Secretary's standard -- namely, to use all feasible engineering to reduce exposure to the permissible level, and provide respirator protection where engineering fails. Accordingly, an employer whose monthly monitoring revealed that he met the permissible

exposure limit would not be subject to a citation for failure to monitor, but would be subject to citation where the Secretary's inspection revealed that he was in fact above the permissible level, and had not used all feasible engineering, or provided respiratory protection against it. The situation is unlikely, if ever, to arise, since in PVC plants, where exposure is greatest, the industry intends to implement constant sequential monitoring (i.e. monitoring every 15 minutes) rather than monitor simply once a month. See Firestone's Brief at pp. 84-85. In any event, an employer should not be free to ignore vinyl chloride leaks and spills for one month simply because the initial monitoring reading showed no impermissible exposure. Monitoring requirements to detect dangerous substances have previously been upheld.[39/] As Judge McGowan stated, Industrial Union Department, AFL-CIO v. Hodgson, 499 F. 2d 467, 481 (C.A.D.C. 1974):

> The monitoring provisions are especially important because the results of that process often determines when and what protective measures are required.
>
> * * * * *

39/ Firestone has argued that the standard is somewhat confusing as to whether continuous monitoring or constant sequential monitoring is called for. Brief for Firestone, pp. 84-85. The purposes of monitoring are as Judge McGowan has stated. The intent of the vinyl chloride monitoring provisions is to gain relatively immediate knowledge as to whether concentrations exceed the permissible level. So long as this intent is served, either continuous monitoring or constant sequential monitoring will suffice.

> Periodic monitoring is important to insure that concentration levels have not been allowed to increase since the initial monitoring. Further, monitoring techniques may not be entirely uniform, and, in any event, concentrations of asbestos in the air may not remain stable throughout a working day or from one day to the next. Thus whether or not the initial monitoring reflects a violation will be the product of several variables other than the actual average concentration of asbestos dust in that plant. In light of these factors, satisfactory results in the initial monitoring would not necessarily justify a conclusion that concentrations in excess of the limits could not be foreseen.

E. The Standard's Hazardous Operation Provisions are Reasonable - 29 C.F.R. 1910.93q(b)(7), (h) and (i).

Tenneco, among others, argues that the hazardous operation provisions of the standard are unreasoned. They are not. That all operations in a PVC plant may at one point or another be hazardous is nothing more than a reflection of the indisputable fact that concentrations above the permissible level of exposure pose a carcinogenic hazard to workers. The standard's hazardous operation provisions simply require, as does the standard generally, that respirator protection be afforded for hazardous operations. The additional precaution of protective clothing is limited to those instances where "skin contact with liquid vinyl chloride or with polyvinyl chloride residue from vessel walls" is likely. 29 C.F.R. 1910.93q(h)(ii). Since vinyl chloride is a gas, not a

liquid, at ambient temperature, and reactor cleaning with new technology would be necessary just once a month, this protective clothing provision is not burdensome. The hazardous operation provisions of the final vinyl chloride standard are far more flexible for industry than those which had been originally proposed. App. 5, 24.

F. There Was No Procedural Error in Promulgating the Standard.

Firestone complains that its inability to cross examine Drs. Wegman and Standaert, as well as the authors of the Snell Report, and lack of notice as to the standard's respirator requirements, denied Firestone a fair hearing. The company is mistaken.

It is difficult to fathom how anyone could claim lack of notice as to the respirator requirement. It was clearly stated in the proposed standard, and industry devoted a substantial measure of its presentation to the shortcomings of respirators, as well as to the fact that industry uses respirators despite those shortcomings.

As to cross-examination of Drs. Wegman, Standaert, and the authors of the Snell Report, the Secretary adequately explained his denial. Brief for Firestone, App. B. The emergency temporary standard was due to expire by statutory command 6 months after its publication -- namely on October 5, 1974. 29 U.S.C. 655(c)(3). There simply was no leeway to re-open the record. In any event, there is no absolute right to cross-examine

every person who submits a written comment at a rule-making hearing. The area covered by Drs. Wegman and Standaert, and the Snell Report, had previously been covered at the hearing itself, and Firestone suffered no prejudice.

IV. The Stay Motions Should be Denied.

Within the last week, SPI, Firestone, Tenneco, and Union Carbide, have moved this Court for a stay of the Secretary's standard or a stay pendente lite. Those motions should be denied.

This brief has demonstrated that vinyl chloride is a proven human carcinogen which has caused the deaths of 13 workers, and that the Secretary's standard regulating worker exposure to it is in all respects reasonable, proper, supported by the evidence, and sensible. Petitioners are unlikely to prevail on the merits, the public interest counsels against a stay, and if there is to be irreparable injury then that will flow from continued worker exposure to vinyl chloride, not from industry's obligations to effectuate the standard. The stay motions should therefore be denied. Virginia Petroleum Jobbers Ass'n v. FPC, 259 F. 2d 921, 925 (C.A.D.C. 1958); Eastern Air Lines, Inc. v. CAB, 261 F. 2d 830 (C.A. 2, 1958).

Beyond this, the Occupational Safety and Health Act contains an explicit provision which industry can avail itself of to free it from its professed dilemma. Section

6(b)(6)(A) of the Act, 29 U.S.C. 655(b)(6)(A), provides in pertinent part:

> Any employer may apply to the Secretary for a temporary order granting a variance from a standard or any provision thereof promulgated under this section. Such temporary order shall be granted only if the employer files an application which meets the requirements of clause (B) and establishes that (i) he is unable to comply with a standard by its effective date because of the unavailability of professional or technical personnel or of materials and equipment needed to come into compliance with the standard or because necessary construction or alteration of facilities cannot be completed by the effective date, (ii) he is taking all available steps to safeguard his employees against the hazards covered by the standard, and (iii) he has an effective program for coming into compliance with the standard as quickly as practicable.

These temporary variance procedures also contemplate the issuance of interim orders suspending an employer's obligation to comply with a provision of a standard until the requested temporary variance is granted or denied. See 29 C.F.R. 1905.10(c); see generally, 29 C.F.R. 1905.1, et seq.

Despite the three months lead time which the Secretary provided, from October 1, 1974, to January 1, 1975, it may be that some in the vinyl chloride industry will nevertheless be unable to meet each provision of the standard by January 1, 1975. They should apply for a variance so the Secretary can fully investigate and examine their difficulties.

In particular, the stay motions now pending before this Court, state that the petitioners will be unable to comply with the respirator requirements of the standard due to the present unavailability of respirators. 40/ This claim should be addressed to the Secretary in the first instance, by an application for a variance order in accordance with 29 U.S.C. 655(b)(6)(A), so that he may fully investigate the claim.

Petitioners can suffer no prejudice whatsoever from this procedure. I am authorized to state that the Secretary of Labor will expeditiously address himself to all applications for a temporary variance from the vinyl chloride standard. I am also authorized to state, that with respect to the claimed unavailability of respirators the Secretary of Labor will consider all

---

40/ The permissible respirators are set forth in the standard itself. Those that have been approved by NIOSH are listed in "NIOSH Certified Personal Protective Equipment" (HEW Publication No. (NIOSH) 75-119 (July, 1974) (as supplemented in Sept. 1974).

Basically, respirators which are permissible, have been approved by NIOSH, and are commercially manufactured, are those set forth at 29 C.F.R. 1910.93q(g)(4) subparts (i), (iii), (iv)(a) - (iv)(b), (iv)(c), (vi)(a) and (vi)(b). See pp. 18-19, supra. These include the Type C, supplied air respirator, continuous flow type, with full or half facepiece, helmet or hood, one currently in use by the vinyl chloride industry. 29 C.F.R. 1910.93q(g)(4)(iii). That respirator, which is permissible for vinyl chloride concentrations not exceeding 1,000 ppm, had been inadvertently omitted from the standard and was added by a correction notice. 39 Fed. Reg. 41848 (Dec. 3, 1974). Counsel for respondents advised petitioners' lead counsel of that correction notice the day prior to its publication.

applications for a temporary variance order on an expedited basis and will grant or deny interim orders to those who apply in the shortest time consistent with reasoned decision. I am further authorized to state that:

> Until such interim orders are granted or denied no applying employer will be cited for failing to comply with the permanent standard's respirator requirements unless exposure levels are above 50 ppm. It is expressly contemplated that these interim orders will be decided with rapidity; that any applicant's failure to comply with 29 U.S.C. 655(b)(6)(B) and implementing regulations by December 23, 1974 will result in dismissal of his application.

The Assistant Secretary of Labor for Occupational Safety and Health, will issue a document to this effect, with copies to all petitioners, and publish that document in the Federal Register. Copies of the document will also be delivered to this Court no later than December 13, 1974.

There is therefore no valid reason for this Court to grant a stay of any part of the Secretary's standard. Should the Secretary deny an application for a variance order, then at that point petitioners can renew their stay motions before this Court. A stay should not now be issued.

CONCLUSION

For the foregoing reasons, the petitions for review should be dismissed, the stay motions denied, and the Secretary's vinyl chloride standard affirmed in all respects.

Respectfully submitted,

CARLA A. HILLS,
Assistant Attorney General,

STEPHEN F. EILPERIN
Attorney,
Department of Justice,
Washington, D. C. 20530.

Of Counsel:

WILLIAM J. KILBERG,
Solicitor of Labor,

BENJAMIN W. MINTZ,
Associate Solicitor for
Occupational Safety
& Health,

MICHAEL H. LEVIN,
STEPHEN YOHAY,
DAVID KUCHENBECKER,
Attorneys,
Department of Labor,
Washington, D. C. 20210.

DECEMBER 1974.

CERTIFICATE OF SERVICE

I hereby certify that on this 9th day of December, 1974, I caused the foregoing brief to be served upon all counsel by delivering by hand a copy to:

George H. Cohen, Esquire
Bredhoff, Cushman, Gottesman & Cohen
1000 Connecticut Avenue, N. W.
Washington, D. C. 20036

Jerome H. Heckman, Esquire
Keller and Heckman
1150 Seventeenth Street, N. W.
Washington, D. C. 20036

John J. Cassidy, Jr., Esquire
Vedder, Price, Kaufman & Kammholz
39 South LaSalle Street
Chicago, Illinois 60603

Allan J. Topol, Esquire
Covington & Burling
888 Sixteenth Street, N. W.
Washington, D. C. 20006

Donald L. Morgan, Esquire
Cleary, Gottlieb, Steen & Hamilton
1250 Connecticut Avenue, N. W.
Washington, D. C. 20036

by mailing, postage prepaid, a copy to:

J. Albert Woll, Esquire
Woll, Mayer & Gold
815 Fifteenth Street, N. W.
Washington, D. C. 20005

Walter B. Connolly, Jr., Esquire
1200 Firestone Parkway
Akron, Ohio 44317

Ms. Donna J. Roberts
2030 Dow Center
Midland, Michigan 48640

Lawrence D. Lenihan, Esquire
Arthur, Dry & Kalish
1230 Avenue of the Americas
New York, New York 10020

STEPHEN F. EILPERIN,
Attorney.